(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 January 2001 (04.01.2001)

PCT

(10) International Publication Number
WO 01/01033 A1

(51) International Patent Classification[7]: F16M 11/00

(21) International Application Number: PCT/US00/17917

(22) International Filing Date: 29 June 2000 (29.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/141,773 30 June 1999 (30.06.1999) US

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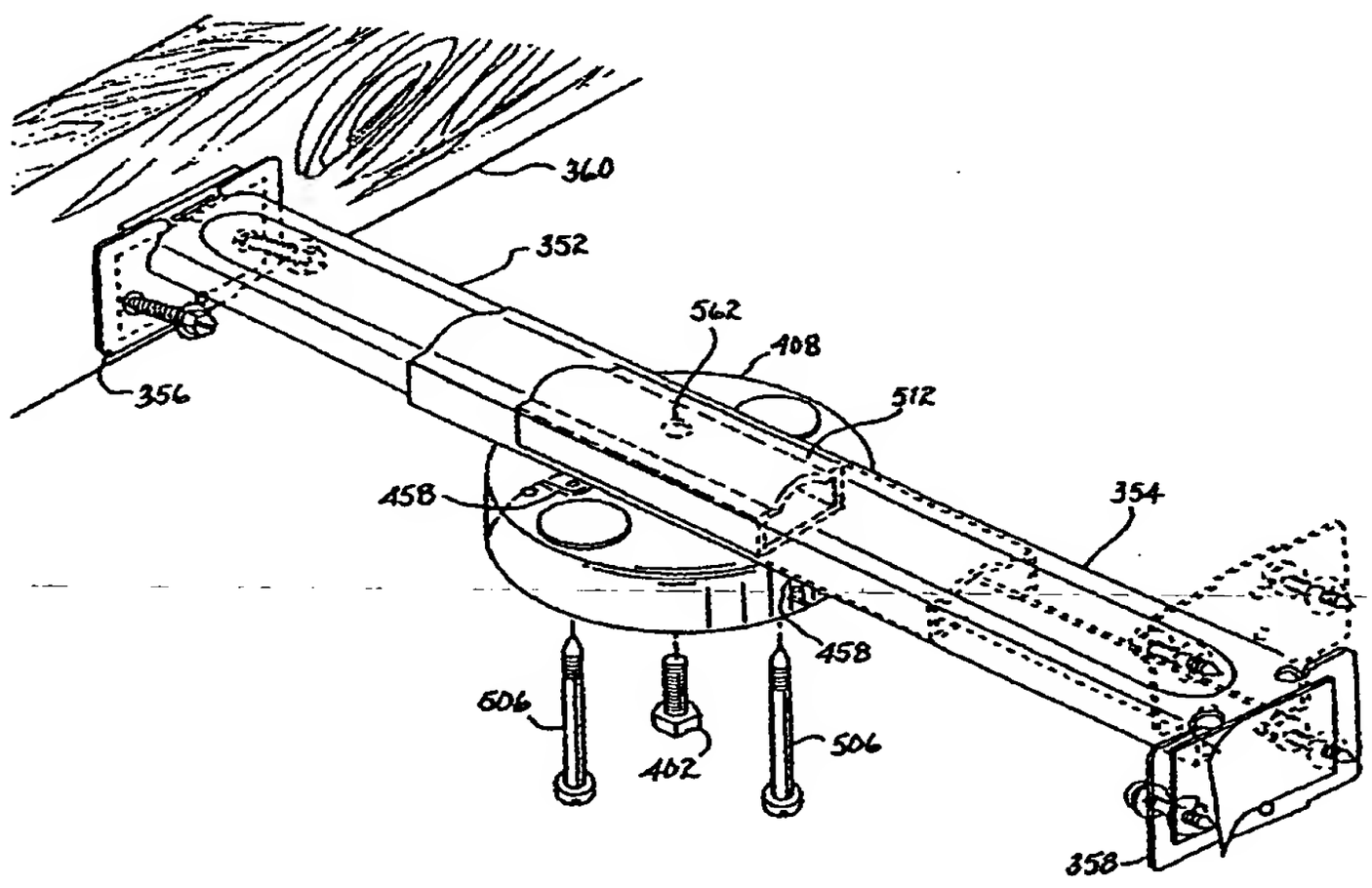
(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FIXTURE SLIDE SUPPORT WITH VARIATIONS



(57) Abstract: A mounting assembly having at least a pair of telescoping support members (352, 354) is affixed between joists (360) or the like to support a fixture. A clamp, made as an insert (512), brace, or sleeve, engages the support members to rigidly clamp them together and prevent movement therebetween. The insert, brace or sleeve provides support for the fixture, whether the fixture is directly attached to the insert, brace or sleeve or from a junction box (408) suspended from the insert, brace, or sleeve. The junction box may include internally attachable elements (402, 506) configured to match a light or heavy fixture. Alternatively, the junction box may have sidewall indentations to receive the fixture retaining elements external to the sidewalls.

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FIXTURE SLIDE SUPPORT WITH VARIATIONS

CROSS REFERENCE TO RELATED APPLICATIONS

This application and the invention described herein claims priority to the subject matter disclosed in a provisional application entitled "Improved Fan Brace Slide Support" filed June 30, 1999 and assigned Serial No. 60/141,773 directed to an invention made by the present inventor and incorporated herein by reference and this application is a continuation-in-part of an application entitled "Fan Brace Slide Support", assigned Serial No. 09/344,334 filed June 25, 1999 which is a continuation-in-part of application no. 08/402,331, filed March 10, 1995 now U.S. Patent No. 5,938,157 issued August 17, 1999, which is a continuation-in-part of application no. 08/371,695, filed January 12, 1995, which is now U.S. Patent No. 5,854,443, issued December 29, 1998, each of which is incorporated herein by reference.

This application relates to application No. 08/490, 757, filed June 15, 1995, now U.S. Patent No. 5,677,512, issued October 14, 1997, and which is a continuation-in-part of application No. 08/371,695, filed January 12, 1995, which is now U.S. Patent No. 5,854,443, issued December 29, 1998, application No. 08/403,226, filed March 13, 1995, which is now U.S. Patent No. 5,873,556, issued February 23, 1999; and application No. 08/381,434, filed January 31, 1995, which is now U.S. Patent No. 5,661,264, issued August 26, 1997.

FIELD OF THE INVENTION

This invention relates to a fixture mounting assembly. More particularly, the invention is directed to a fixture slide support assembly which is particularly suited for installation on one, or between two or more supporting surfaces. Specifically, the invention relates to an electrical fixture slide support having temporary and/or permanent securing elements for securing the support to a mounting surface or between two or more mounting surfaces.

BACKGROUND OF THE INVENTION

Conventional supports are known for mounting fixtures to ceilings during new construction, and as retrofit installations in existing structures.

Nowadays, not only are fixtures, such as chandeliers and ceiling fans, becoming even more heavier than prior art fixtures, but building codes are becoming more strict. Thus, there is a need for a fixture mounting assembly which can carry relatively high static and dynamic loads.

There is likewise a need for a fixture mounting assembly which can be used for new construction as well as for retrofit installations, is easy to operate, stronger, and more stable than existing devices.

An example of existing technology is shown in my earlier U.S. Patent No. 4,463,923 to Reiker which discloses an expandable junction box/fixture hanger assembly for heavy duty applications. Although that hanger assembly works well, there is a need for a fixture mounting assembly which is even simpler to fabricate and easier to use, while meeting the requirements of supporting heavy and/or vibrating fixtures.

U.S. Patent No. 3,214,126 to Roos is of interest for its disclosure of an outlet box support having mating telescoping bar members 12, 14 comprising a hanger bar. The Roos sidewalls of bar member 12 have interned flanges or lips which project inwardly and are spaced from and parallel to the Roos connecting wall. Roos states that the bar members are identical except as to differences in size. Roos discloses mounting/clamping together an electrical box to the hanger bar by use of a mounting device. The Roos mounting device is considered to be relatively complicated.

U.S. Patent No. 3,518,421 to Cogdill for a hanger structure discloses telescoping members mountable to an electrical junction box, analogous to the above-described Roos outlet box support.

U.S. Patent No. 2,528,418 to Buckels discloses telescoping mounting members and mounting flanges having holes therein. Fasteners, such as nails or screws, are inserted through the holes in the mounting flanges for securing the Buckels device to a joist, for example. Buckels expects the depth of the mounting flanges to be substantially equal to the depth of the attached outlet box minus the thickness of the wall construction formed on the joists. Thus, Buckels expects the device to be properly located with respect to the surface of a finished wall surrounding the electrical box.

U.S. Patent No. 2,945,661 to Appleton discloses a telescoping bar hanger assembly having mounting flanges which are mountable to a joist by hammering nails through openings provided thereon. Appleton suggests that sharp lanced or struck-out deformation having outwardly extending teeth be provided around the nail holes for facilitating the mounting of the bar hanger between joists.

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SUMMARY OF THE INVENTION

A slide brace extendible between joists or the like dependingly supports a ceiling fan or other fixture. Plates disposed at opposed ends of the slide brace may include adhesive means for a temporary attachment and screws may be initially threadedly supported in holes to simplify and enhance attachment to the joists or the like. An insert or a sleeve of any of various conventional configurations rigidly secures telescoping support members of the slide brace to one another and provides a rigid robust mounting for an attached fixture and associated junction box of any of one or more configurations.

Accordingly, it is an object of an invention to provide a mounting assembly which overcomes the drawbacks and disadvantages of the prior art devices.

An object of the invention is to provide a mounting assembly which can be installed on one, or between two or more mounting surfaces.

An object of the invention is to provide a mounting assembly which can be installed at a variable distance form one, or between two or more mounting surfaces.

A further object of the invention is to provide a mounting assembly which can be inexpensively manufactured.

Yet another object of the invention is to provide a mounting assembly which is suited for use in new construction as well as for retrofitting in existing walls and ceilings.

A still further object of the invention is to provide a mounting assembly configured so that large static and dynamic loads are transferred directly to the structure in which the mounting assembly is installed, as opposed to the forces being transferred to a junction box attached to the mounting assembly.

Another object of the invention is to provide a mounting assembly which is more resistant to oxidation and rusting than earlier devices.

It is yet another object of the invention to provide a mounting which utilizes the strength of a substrate in which the mounting assembly is installed (i.e., a floor, wall, or ceiling) for carrying the load of a fixture attached at the junction box mounting site.

Another object of the invention is to provide a mounting assembly which is easier and faster to install and use than conventional devices.

Yet a further object of the invention is to provide a mounting assembly having an attachment site to which fixtures can be more readily attached than with conventional devices.

A yet further object of the invention is to provide a mounting assembly having an expandable support which is infinitely adjustable for mounting between joists, for example.

Another object of the invention is to provide a mounting assembly in which relatively adjustable mounting members can be moved easily relative to each other, yet which mounting members can be easily rigidly locked together for enhancing the load-carrying characteristics thereof.

A yet further object of the invention is to provide a mounting assembly which is further strengthened when a fixture is attached thereto.

In summary, therefore, the invention is directed to a mounting assembly which is strong, easily and readily used, and which overcomes the drawbacks of prior art devices.

In one embodiment of the invention, the mounting assembly includes a support having a first member and a second member, and a support bar disposed adjacent the first and second support members. A junction box is provided adjacent the support bar. A first fixture fastener extends from said support into the junction box cavity. The first fixture fastener is configured for transferring forces exerted on said fixture fastener

substantially without exerting such forces on the junction box.

In another preferred embodiment of the invention, a mounting assembly is provided having means for supporting a fixture relative to a wall, said support means for supporting a fixture relative to a wall, said support means including first and second members disposed adjacent each other. A support bas is provided, and a junction box is located adjacent the support bar. A first fixture fastener extends from the support into the junction box cavity, and the first fixture fastener is configured for transferring forces exerted on the first fixture fastener substantially without exerting such forces on the junction box.

The invention will be further described with reference to the following drawings.

These and other objects of the present invention will become apparent to those skilled in the art as the description thereof proceeds.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described with greater specificity and clarity with reference to the following drawings, in which:

Figure 1 is a perspective view of a first preferred embodiment of a mounting assembly according to the invention;

Figure 2 is a bottom plan view of the first preferred embodiment of the mounting assembly of Figure 1;

Figure 3 is a sectional view taken along lines 3-3 shown in Figure 1;

Figure 4 is a side elevational view of a further preferred embodiment of a mounting assembly according to the invention;

Figure 5 is a sectional view taken along lines 5-5 shown in Figure 4;

Figure 6 is a further, partial sectional view of the preferred embodiment of Figure 4;

Figure 7 is a somewhat schematic, sectional view of the first and second sliding members according to a preferred embodiment of the invention, when in an unclamped, slidable state;

Figure 8 is a side view of a still further preferred embodiment of a mounting assembly according to the invention;

Figure 9 is a PRIOR ART device, when in use;

Figure 10 illustrates a mounting assembly;

Figures 11 and 12 illustrate screw retention apertures in a mounting plate;

Figure 13 illustrates a cross-section of the mounting assembly shown in Figure 10;

Figures 14 and 15 illustrate top and bottom views of a plate useful with a circular junction box;

Figures 16 and 17 illustrate a plate usable in conjunction with square junction boxes;

Figure 18 illustrates a cross-section of a mounting assembly embodying a brace;

Figure 19 illustrates an isometric view of a brace used in the mounting assembly shown in Figure 18;

Figure 20 illustrates a cross-section of a mounting assembly embodying a brace;

Figure 21 illustrates a cross-sectional view of a plate interconnecting a junction box with a mounting assembly to provide the structural support;

Figure 22 illustrates an insert usable with the mounting assembly shown in Figure 21;

Figure 23 illustrates a cross-sectional view of an mounting assembly embodying a sleeve and a plate;

Figure 24 is an isometric view of the sleeve shown in Figure 23;

Figures 25 and 26 illustrate isometric views of an insert;

Figure 27 is a bottom view of an insert located within telescoping support members;

Figure 28 illustrates a mounting assembly having an insert;

Figure 29 illustrates a mounting assembly having an insert for supporting a fixture;

Figure 29a is a partial cross-sectional view of the mounting assembly shown in Figure 29;

Figure 30 is an isometric view of the insert shown in Figure 29;

Figure 31 illustrates a mounting assembly having an external sleeve;

Figure 32 is a partial cross-sectional view of the mounting assembly shown in Figure 31;

Figure 33 illustrates a mounting assembly embodying a sleeve;

Figure 34 is an isometric view illustrating the sleeve shown in Figure 33;

Figure 35 is a partial cross-sectional view of the mounting assembly shown in Figure 33;

Figure 36 illustrates a mounting assembly embodying a sleeve and an inserted plate;

Figure 37 is an isometric view illustrating a plate usable with the mounting assembly shown in Figure 36;

Figure 38 is a partial cross-sectional view of the mounting assembly shown in Figure 36;

Figure 39 illustrates a variant of the plate shown in Figure 37;

Figure 40 is an isometric view illustrating the variant shown in Figure 39 within the sleeve shown in Figure 36;

Figure 41 illustrates a mounting assembly having an internal plate;

Figure 42 is an isometric view illustrating the plate shown in Figure 41;

Figure 43 is a partial cross-sectional view of the mounting assembly shown in Figure 41;

Figure 44 illustrates the location of the plate within the mounting assembly shown in Figure 41;

Figure 45 illustrates telescopically related support members and mounting plates;

Figure 46 illustrates the nesting of the support members shown in Figure 45;

Figure 47 is a partial cross-sectional view of a mounting assembly embodying the support members shown in Figure 45;

Figure 48 is a partial cross-sectional view showing a variant clamping structure for the support members shown in Figure 45;

Figure 49 is a partial cross-sectional view of nested C-channel support members;

Figure 50 illustrates an inverted C-channel disposed within a mounting assembly;

Figure 51 is a partial cross-sectional view of the mounting assembly shown in Figure 50;

Figure 52 illustrates a variant junction box usable with the support assembly shown in Figure 50;

Figure 53 is a partial cross-sectional end view of the mounting assembly shown in Figure 52;

Figure 54 is a detail view of the support embodied in the mounting assembly shown in Figure 53;

Figures 55 and 56 illustrate a variant junction box;

Figure 57 is a partial cross-sectional view of a mounting assembly supporting a junction box; and

Figures 58, 59 and 60 show variants of nested support members useful with selected mounting assemblies.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to Figures 1 -3, a first preferred embodiment of a mounting assembly 10 according to the invention is shown. Mounting assembly 10 includes a support 14 having a first support member 18 and a second support member 20. Preferably, first member 18 is slidable relative to second member 20 when being installed. A support bar 24 is provided for strengthening the overall mounting assembly 10. Preferably, support bar 24 is configured for attaching a junction box 30, as well as an unillustrated fixture, such as a ceiling fan and the like. Good results have been achieved when support bar 24 is provided substantially adjacent the first and second support members 18 and 20. A junction box fastener 32 attaches junction box 30 to support 14. A first fixture fastener 34 extends from support 14 through junction box 30 for transferring forces exerted by a fixture mounted on first fixture fastener 34 substantially directly to support 14 without transmitting such forces onto junction box 30. Good results have been achieved when a second fixture fastener 36 is used in conjunction with first fixture fastener 34.

A first mounting plate 40 is provided on a free end of first member 18. Preferably, a second mounting plate 42 is provided on the spaced opposed free end of second member 20. Optionally, a connector 46 may be provided between second mounting plate 42 and second member 20. For example, connector 46 can be in the form of an area of reduced material thickness, such as by the provision of a groove made by cutting or stamping. To further enhance the bendability of second mounting plate 40 relative to second member 20, for example, optional stress relief cut-outs 48 can be provided. Still further, a tab 50 can be provided, which tab 50 is secured at an attachment site 52. Optional stress-relief cut-outs or through-holes 53 can be provided. A free edge 54 is configured to align with a joist and/or ceiling when installed. Good results have been realized when connector 46 was retained and cut-outs 48 and through-holes 53 were omitted.

First mounting plate 40, second mounting plate 42, and tab 50 can be bent relative to respective first member 18 and second member 20 before or after sale to the end user. One or more mounting holes or permanent securing elements 60 may be provided in first

and second mounting plates 40, 42. Permanent securing elements 60 may be provided with female threads or previously attached male fasteners such as screws or nails. In addition, one or more punch-outs 64 are preferably provided in a bottom 62 of junction box 30. Typically, punch-out 64 will be spaced from a wall 67 which further defines the cavity of junction box 30.

A plurality of supplemental holes 68, 70, 72, and 74 may be provided in bottom 62 of junction box 30. Supplemental holes 68, 70, 72 and 74 may be formed as square holes to mate with the square neck portion of conventional carriage bolts. Fist and second fixture fasteners 34 and 36 may be such carriage bolts. The provision of multiple holes, including supplemental holes 68, 70, 72 and 74 allows for varying the spacing between first fixture fastener 34 and second fixture fastener 36. Thus, in the illustrated first preferred embodiment, such as shown in Figures 1 and 2, first fixture fastener 34 is spaced apart from second fixture fastener 36 at the greatest illustrated distance. If the fixture to be attached to first and second fixture fastener 36 can be moved closer to first fixture fastener 34 by loosening thereof, and moving second fixture fastener 36 to hole 78. In such a case, junction box 30 would be rotated slightly about junction box fastener 32, until supplemental hole 70 aligns with alternate square hole 78. Second fixture fastener 36 would then be inserted through both square hole 78 and supplemental hole 70.

Features of support 14 can be further understood by considering Figures 3, and 7, which is described in greater detail below. Figure 3 illustrates how support 14 can be rigidified. Junction box fastener 32 can be detachably secured to support bar 24 by use of a nut 84, such as a conventional self-locking nut. A washer 88 can be provided between nut 84 and support bar 24. A further nut, such as a self-locking nut 92, can be used for securing junction box 30 to support 14. Clamping means, such as an extension 94 on support bar 24 can be configured for engaging a lip 98 on second mounting member 20, which lip 98 abuts a further lip 96 on first mounting member 18. Figure 3 illustrates the locked, rigidified state of support 14 when self-locking nut 92 has been tightened against junction box 30 with sufficient torque so that relative movement between support bar 24, second member 20 and first member 18 is prevented. In the manner, support 14 assumes

its rigidified, essentially integral state of greatest strength.

Figures 4-6 illustrate a further preferred embodiment of a mounting assembly 100 according to the invention. Mounting assembly 100 has many elements in common with the mounting assembly 10 of Figures 1-3. One of the differences is that a junction box 130 can be provided with a larger cavity and, hence, useable volume for making wiring connections. Thus, in this preferred embodiment, a wall 168 of junction box 130 will be relatively long. A first mounting plate 140 is provided on a free end of first member 18, and a second mounting plate 142 is provided on a spaced opposed free end of second member 20. An electrical grounding screw 108 conveniently provided inside junction box 130.

First and second mounting plates 140, 142 preferably extend in the direction of the side on which junction box 130 is mounted. Namely, first and second mounting plates 140, 142, extend downwardly as viewed in Figure 4 (and as viewed when mounting assembly 100 is installed in a ceiling for mounting a ceiling fan, for example). A plurality of mounting holes 160 is provided in each of first and second mounting plates 140, 142. Good results have been achieved when sharp extensions or "blowouts" 162 extend outwardly from first and second mounting plates 140, 142. Blowouts 162 can be manufactured at the same time as mounting holes 160 by the use of a punch which pierces first mounting plate 140, for example, forms mounting hole 160, and leaves punched-out material attached to first mounting plate 140 that functions as a securing and mounting element when mounting assembly 100 is in use. For example, blowouts 162 will be fabricated sufficiently sharp so as to be easily stabbed into a typical wooden joist J, as described under OPERATION below.

Figure 7 is a somewhat schematic end view of first member 18 and second member 20 when in an unclamped, freely slidable state. The embodiment of Figure 7 is used with the preferred embodiments of Figures 1-3 and 4-6. First member 18 includes a central region 202, and an outer region 206. Central region 202 can have an outwardly curved configuration for resisting bending and strengthening first member 18. A side

wall 210 extends away from outer region 206. Good results have been obtained when outer region 206 and side wall 210 define an angle therebetween of about 95°-100°; in other words, an angle 214 will be about 80°- 85°. Second member 20 includes a central region 232 and an outer region 236 extending therefrom. A side wall 240 is attached to and extends away from outer region 236. Lip 98 extends away from side wall 240. Good results have been achieved when side wall 240 and outer region 236 define an angle of about 90° therebetween, when second member 20 having such a 90° included angle has been used with the first member 18 having the included angle of about 95°- 100°, as described immediately above.

It has been found that the illustrated profiles of first member 18 and second member 20 slide well relative to each other when loose, and resist sliding when first member 18, second member 20, support bar 24, and junction box 130 have been clamped together as shown in Figures 4-6 (as well as shown in Figures 1-3, described above).

The configurations of first and second members 18, 20 illustrated in Figure 7 satisfy many of the objects of the invention; namely, first and second members 18, 20 are readily and inexpensively manufactured, while optimizing the use of materials, and achieving the goal of an adjustable length support which is easily adjusted, yet which is strong and rigid when in its clamped state.

Figure 8 illustrates a still further preferred embodiment of a mounting assembly 250 according to the invention. Many elements of mounting assembly 250 are similar to those of mounting assembly 100 of the preferred embodiment of Figures 4-6. A difference is that a piece of double-sided tape 252 is placed on one or both of first and second mounting plates 140, 142. As illustrated, double-sided tape 252 substitutes for sharp extensions or blowouts 162 of the preferred embodiment of Figures 4-6. It is contemplated that double-sided tape 252 be used in addition to such blowouts, depending on the intended use. It is likewise contemplated that other tapes, adhesives, glue patches, and the like be used instead of, or in addition to double-sided tape 252. It is important that the adhesive used be sufficiently strong to temporarily support mounting assembly

250 in place, while fasteners are being inserted through mounting holes 60 for permanent installation. It is likewise expected that a spray adhesive be applied instead of tape 252.

Figure 8 likewise illustrates how mounting assembly 250 can be successfully installed between widely spaced apart joists. As illustrated, mounting assembly 250 has been opened to a setting which is so wide that first member 18 no longer overlaps second member 20. Thanks to the inherently strong construction of mounting assembly 250, the assembly 250 is sufficiently strong even when in such an expanded position.

In the illustrated position, it will be appreciated that second member 20, support bar 24, and junction box 130 have been locked relative to each other. Self-locking nut 92 has been tightened against junction box 130 with sufficient torque so as to achieve that locked, rigidified state. In a like manner, first support member 18, support bar 24, and junction box 130 have been tightened relative to each other and rigidified at the same time by self-locking nut 92 and junction box fastener 32. The preferred embodiments of Figures 1-3 and 4-6 can have their first and second members 18, 20 likewise extended and rigidified as in this preferred embodiment of Figure 8.

Figure 9 illustrates a PRIOR ART device 280 having a left support 284 and a right support 286, which are movable relative to each other. An overlapping portion 288 is established by the free ends of left support 284 and right support 286 being clamped by conventional fastener 290. Owing to the weight of junction box **B** and the associated fixture applying a downward force **F** such PRIOR ART devices 280 have a tendency to sag. Such sagging results in an undesirable gap 300 between the intended location of the top **T** of junction box **B** and the resultant, actual location thereof. Accordingly, PRIOR ART device 280 have a tendency to come apart (i.e., free ends of left and right supports 284, 286 disengage and separate). Thus, structurally unsound, and unaesthetic sagging of ceiling **C** results from gap 300 arising during use.

Mounting assembly 10 of the first preferred embodiment of Figures 1-3 is used and installed as follows. In the case where mounting assembly 10 is to be installed in the

ceiling of a building, the user ensures that nut 92 is sufficiently backed off so that first member 18, second member 20, and support bar 24 move easily relative to each other. In the case where mounting assembly 10 is to be installed between a pair of spaced apart existing joists J, the user slides first member 18 outwardly away from second member 20 a sufficient distance so that first mounting plate 40 engages the side of a joist and second mounting plate 42 engages the side of an adjacent joist. Fasteners, such as nails or screws, are inserted through mounting holes 60 and secure mounting plates 40, 42 to the respective joists. In the case where permanent mounting elements 60 are screws or nails, they are fastened to joists in the usual fashion. The phantom line depiction of first mounting plate 40 shows the orientation thereof when installed. Likewise, the phantom line designation of tab 50 shows the orientation thereof when installed.

In the case of new construction, when there is no ceiling attached to the joists, the user aligns free edge 54 of tab 50 with the bottom free edge of the joist to provide the correct spacing for installing a typical drywall ceiling.

In the case of a retrofit installation with an existing ceiling attached below the joists, the user simply installs mounting assembly 10 from above (when access to the installation site if available from above, such as from an attic in a residential house). When no attic access is available the user slides the entire mounting assembly 10 upwardly through a hole made in the ceiling. For example, the user can slide assembly 10 through a junction box aperture. With an existing ceiling, the installer can simply allow free edges 54 of respective tabs 50 to rest on the ceiling while the installer permanently secures first and second mounting plates 40, 42 to the joists.

After mounting assembly 10 has been secured to the joists, the final operating length of support 14 is established. The installer fixes that final established length and rigidifies and strengthens support 14 by clamping first member 18, second member20, support bar 24, and junction box 30 together. Such a rigidly clamped together state is achieved by tightening down junction box nut 92 on junction box fastener 32, thereby pressing junction box 30 tightly against lips 98 on second member 20, while extensions

94 on support bar 24 concurrently press against lip 98. See Figures 3, 5, and 7, for example.

In addition, good results have been achieved when first member 18, second member 20, support bar 24, and junction box 30 are rigidly clamped together at second and third locations; namely, when nuts are tightened down on first fixture fastener 34 and second fixture fastener 36.

As will be readily apparent, the tightening of nuts on first and second fixture fasteners 34, 36 presses junction box 30 tightly against lips 96 of first mounting member 18 while the leads of first and second support fixture fasteners 34, 36 press tightly against support bar 24, whereby extensions 94 press tightly against lips 98 on second mounting member 20 and, hence, against lips 96. Such nuts securing first and second fixture fasteners 34, 36 can engage junction box 30 in the same manner as nut 92 on junction box fastener 32 engages junction box 30.

Likewise, good results have been achieved when nuts are used on first and second fixture fasteners 34, 36 outside of junction box 30 for pressing against a cover plate on junction box 30 or for securing a fixture to fasteners 34 and 36 and, hence, pressing junction box 30 tightly against support 14 (i.e., tightly against lips 96 of first member 18).

Once junction box 30 has been clamped tightly, then a fixture, such as a ceiling fan or a chandelier, is attached to one or more of first and second fixture fasteners 34, 36.

The installation of the preferred embodiment of Figures 4-6 is similar to the installation of the embodiment of Figures 1-3.

It should be noted that in the embodiment of Figures 4-6, when assembly 100 is installed in a ceiling, for example, first and second mounting plates 140, 142 extend downwardly, as shown in Figure 5. The free edges of mounting plates 140, 142 and/or the free edge of supplemental spacing element 158 is substantially aligned with the lower

free edge of a joist J, and then mounting assembly 100 is secured in place between the adjacent joists J by fasteners inserted through holes 160. Blowouts 162, when provided, are used to temporarily secure mounting assembly 100 in place.

It will be appreciated that the distance between the free edge of first and second mounting plates 140, 142 or the free edge of supplemental spacing element 158 and free edge 182 of junction box 130 is preferably sized so that a typical ceiling material, such as drywall, fits therein and has its outward face substantially aligned with free edge 182.

As will be appreciated, mounting assembly 250 of the embodiment of Figure 8 is installed in a manner similar to the installation of assembly 100 described immediately above. A difference is that adhesive or double-sided tape 250 is used for temporarily attaching mounting assembly 250 in place. Depending on the type of adhesive or tape used, and the intended use, a protective coating or removable cover material will protect double-sided tape 252 from degradation during storage prior to use.

It is contemplated that the fixture mounting assembly will be made of materials such as galvanized steel, plastics, and the like.

It should be understood that the size and configuration of the first and second support members, the junction boxes, the fasteners, and the like will be varied as required.

Good results have been achieved when the length of the support bar was made substantially equal to the width of the junction box.

Figure 10 illustrates a mounting assembly 350 having support member 352 telescopically engaged with the interior of support member 354. A mounting plate 356 is located at one end of support member 352 for engagement with a joist 360. A similar mounting plate 356 is located at an end of support member 354 for engagement with a joist. As illustrated in phantom line 362, either or both of the mounting plates may be

bent upwardly instead of downwardly for attachment to a joist or other support structure. To enhance rapid attachment of the mounting assembly to a support structure, each of mounting plates may have secured therein screws 364 partially penetrating respective apertures 366 in each mounting plate, as shown in further detail in Figures 11 and 12. To retain the screws during the mounting process, aperture 366 is preferably sized equivalent to shank 368 of each screw. Moreover, each aperture may include a one revolution thread, as represented in Figures 11 and 12. Initial attachment may be further enhanced by a section of double-stick tape 370 located on the side of each mounting plate which will be placed adjacent the support structure. Prior to use, the exposed adhesive surface of the double-stick tape may be protected by removable sheet 372 as shown in Figure 10.

Referring jointly to Figures 10 and 13, further details attendant mounting assembly 350 will be described. Support member 352 includes a raised curved central region 374 extending for the length of the support member. A similar raised central region 376 is formed in support member 354. Side walls 370, 380 of support member 374 extend downwardly and support in turned lips 382, 384, which lips define a slot 386 therebetween. Similarly support member 354 includes side walls 388, 390 extending downwardly to support in turned lips 392, 394, respectively, which lips define a slot 396 therebetween. A clamp, such as elongated plate 400, is disposed within support member 352 to rest upon lips 382, 384 of the support member. A bolt 402 extends through aperture 404 of plate 400 downwardly through slots 386, 396 into penetrable engagement with a centrally located aperture 406 in junction box 408. By tightening nut 410, plate 400 is drawn against lips 382, 386 of support member 352 to exert a clamping force upon lips 392, 394 of support member 354 and base 412 of junction box 408. Such clamping force will preclude relative movement between the support members.

In the embodiment shown in Figure 10, the primary function of junction box 408, is to provide an enclosure for electrical connections to provide electrical power to a fixture supported by mounting assembly 350. The weight of such fixture is born by threaded receivers 414 extending through apertures in plate 400, which threaded receivers include heads 416 supported by plate 400, as representatively shown in Figures 14 and

15. Junction box 408 includes indentations 418 formed in side wall 420, through which the threaded receivers extend. Bolts 422 extend upwardly from the fixture to be supported into threaded engagement with respective ones of threaded receivers 414. Thereby, plate 400 serves three primary functions. First, it clamps support members 352, 354 to one another to prevent longitudinal displacement therebetween. Second, it provides direct structural support for a fixture to be suspended from the mounting assembly. Third, it spreads the downward force exerted on the mounting assembly by the fixture along the support members to minimize a likelihood of downward bending or destruction of the support members.

Figures 16 and 17 illustrate top and bottom views of an essentially square junction box 450 usable with mounting assembly 350 shown in Figure 10. Junction box 450 includes indentations 452 disposed at diagonally opposed corners. It is to be noted that these indentations may also be formed in opposed sides. Bar 400, at the top of the junction box, includes apertures 415 for penetrably receiving threaded receivers 414 having heads 416 supported by plate 400. Aperture 404 in the plate corresponds with aperture 454 in the junction box. In the event a light weight fixture is to be attached to junction box 450, bolts (506) having a threaded end and an essentially or substantially smooth surfaced shank for the portion of the bolt disposed within the junction box may be used. Such bolt would extend through aperture 456 disposed in each ear 458 for threaded engagement with a corresponding threaded aperture 460.

Figures 18 and 19 illustrate use of a brace 466 for clamping telescoping support members 468, 470 to one another and as support for junction box 472. Herein, the support members are arcuate elements nestable one within the other. A clamp, such as a brace 466, includes a central curved element 474 generally commensurate in curvature and depth with support members 470, 472. Planar opposed ends 476, 478 of the brace rest upon junction box 472 and include apertures for penetrably receiving and supporting threaded receivers 414. These receivers may be press-fit into junction box 472 through apertures 480. Between each planar end and the curved element there is formed a panel 482 or 484, each of which panels is apertured with a threaded aperture 486. A pair of

bolts 488 extend upwardly through the junction box into threaded engagement with respective ones of threaded apertures 486. After support members 468, 470 have been mounted intermediate to joists or other supporting elements, in the manner shown for example in Figure 10, and after having been inserted intermediate brace 466 and junction box 472, bolts 488 are tightened. Such tightening will draw panels 482, 484 downwardly toward junction box; they are displaced therefrom, as indicated in the quiescent state. Upon drawing down panels 482, 484, curved element 474 will bear upon the underlying support members to force their respective lower edges against the junction box. Depending upon the relative dimensions of the support members, they may also become clamped against one another by the forces exerted through curved element 474. Thereby, the support members are clamped to one another and will provide the necessary immobility to rigidly support junction box 472 and a fixture depending therefrom.

Referring to Figure 20, there is shown a variant of the structure shown in Figures 18 and 19. Herein, support members 374, 376 are similar to those shown in Figure 10 and 13. A brace 490 includes a central section 491 configured similarly to the cross sectional configuration of support member 376. Panels 492, 494 extend in opposed directions therefrom at a location displaced from junction box 496. Planar ends 498, 500 extend laterally essentially adjacent with junction box 496 and are interconnected with panels 492, 494 through depending legs 502, 504. The panel ends are attached to the junction box by rivets 505, as shown, or by other means well known to those skilled in the art. Screws 508, like screws 488 shown in Figure 18, extend upwardly through the junction box into threaded engagement with panels 492, 494.

After mounting of the mounting members, as shown in Figure 20, screws 508 are tightened to draw down panels 492, 494. Such movement will exert pressure upon central section 491 to clamp support members 374, 376 to one another and against junction box 496. As a result, brace 490 will cause the support members to become rigidly mounted and the brace will support the junction box and any fixture attached thereto. As described above with reference to Figures 16 and 17, bolts 506 penetrably extend through the apertures in ears 458 into threaded engagement with apertures 460.

These bolts may be used to secure a relatively light weight fixture to the junction box.

Referring jointly to Figures 21 and 22 there is shown a junction box 472 similar to that shown in Figure 18. A plate 510 extends there across and threaded receivers 414 penetrably supported by the plate extend into the junction box. Telescoping support members 374, 376 are similar to those shown in Figure 10. A clamp, such as tubular insert 512, has a cross-sectional configuration essentially equivalent to the cross-sectional configuration of the inside surface of support member 374. A carriage bolt 514, having a square shank 516 immediately below head 518 extends through square aperture 520. The remaining part of the shank is disposed in slots 522, 524 at the base of support members 374, 376, respectively. Plate 510 and junction box 472 include apertures for penetrably receiving carriage bolt 514. A nut 526 and lock washer 528 is threadedly engaged with carriage bolt 514. Upon tightening of the nut, head 518 of the bolt will bear against bottom 530 of insert 512 to cause the bottom to clamp lips 392, 394 of the support members to one another and to plate 510. As a result of such clamping, the support members become locked with one another and the mounting assembly will be rigid. The weight of a fixture attached to threaded receivers 414 will be borne by plate 510, which, in turn, is supported by the mounting members through bolt 514.

The mounting assembly shown in Figures 23 and 24 is similar to that is shown in Figures 21 and 22; accordingly, only the differences will be discussed. A clamp, such as sleeve 534, is disposed about support members 376, 374 and is of equivalent cross-sectoral configuration. A bolt 546 includes a head 548 disposed within support member 374 and its shank 550 extends through the slots of support members 374, 376, through aperture 552 in sleeve 534 and plate 510. An aperture 552 may be formed in junction box 496 (which is like the junction box shown in Figure 20) to accommodate insertion of a lock washer 554 and a nut 556. Alternatively, the junction box may be apertured to receive the shank of bolt 546 such that the lock washer and nut would bear against the junction box instead of against plate 510.

Upon tightening nut 556, head 548 would bear against the lips of support

members 374, 376 to clamp the support members against bottom 558 of sleeve 534. Such tightening of the nut would also draw plate 510 against the bottom of the sleeve and provide support for the plate. The plate is attached to junction box 496 by rivets 506 or other fastening means. A fixture is attached to junction box 496 by bolt 506 extending through ears 468 into threaded engagement with threaded aperture of 460. Alternatively, plate 510 may include a threaded aperture 560 for threadedly engaging the bolts.

Referring jointly to Figures 25, 26 and 27, there is shown a variation of the insert and sleeve shown in Figures 21, 22, 23 and 24. If a carriage bolt is not to be used with insert 530, a conventional hole 562 may be formed in the bottom of insert 512. Whether for the sleeve or the insert and whether a carriage or conventional bolt is to be used, a further hole 564 may be formed in the upper central section of the insert/sleeve to permit the insertion of the bolt. Figure 27 illustrates in a perspective view the location of hole 562 (or hole 554-see Figure 23) disposed intermediate slot 522 of support member 394 and slot 524 of support member 392.

Figure 28 includes a support assembly similar to that described above with respect to Figure 27 and other figures except that a junction box 408 (see for instance Figure 10) is used therewith. Thus, the junction box will be described in detail. Threaded receivers 414 extend through apertures in junction box 408 and are supported thereon by heads 416. For heavy fixtures to be attached to the junction box, bolt 422 may be brought into engagement with the fixture and threadedly secured to the threaded receivers 414. For lighter weight loads, bolts 506 may be used. Such bolts are inserted through apertures in respective ears 458 and brought into threaded engagement with threaded apertures 460. As discussed above, the shank of each of bolts 506 is essentially smooth surfaced along the length substantially corresponding to the length of the bolt disposed within junction box 408.

Referring jointly to Figures 29, 29a, 30 and 31, a further variant of mounting assembly 350 shown in Figure 10 will be discussed. For the sake of brevity, only the differences therebetween will be primarily discussed. Insert 512, lodged within support

members 352, 354, includes a central aperture 562 for penetrably receiving a bolt 402 which cooperates with a nut 554 (or threads in aperture 562) to secure the insert with support members 352, 354. Alternatively, sleeve 534 (as shown in Figures 23, 24 could). To attach a relatively light weight load to junction box 408, bolts 506 may be used. Each of these bolts penetrably engages the aperture in one of ears 458 after such penetration, each of the bolts is pushed upwardly through the slot defined by support members 352, 354 (discussed above) and into threaded engagement with a respective one of threaded apertures 566, 568 formed in insert 512/sleeve 534. Thereby, the load of the fixture secured by bolts 506 is supported by the insert sleeve and not by junction box 408.

Figures 31 and 32 illustrate a variation of the sleeve shown in Figure 23 for rigidly securing support members 352, 354 to one another. With respect to common subject matter previously discussed, common reference numerals will be employed and the above discussion will be primarily directed to differences illustrated in Figures 31 and 32. The cross-sectional configuration of each of support members 352, 354 includes an upper hat section 570, 572. The size of hat section 570 of support member 352 is sized to capture head 574 of bolt 576 to prevent the bolt from rotating about its longitudinal axis; the size of hat section 572 accommodates insertion of support member 352. The bolt is supported upon lips 382, 384 of support member 352 and within slot 386. The bolt extends through slot 396 defined by lips 392, 394 of support member 354. The bolt extends downwardly through an aperture 578 of sleeve 569 and through an aperture 580 in junction box 472. Upon tightening of bolt 582 against washer 584, the lips of the support members 352, 354 will be clamped against the bottom surface of sleeve 569 and the surface of junction box 472. That is, by turning bolt 382, will become threaded or unthreaded upon bolt 576 as the bolt cannot turn due to interference with between head 574 of the bolt and hat section 570 of support member 352. Junction box 472 may include threaded receivers 414 for threaded engagement with bolts 422 to secure a relatively heavy fixture to the junction box.

Figures 33, 34 and 35 illustrate a sleeve 590 having a cross-section similar to sleeve 534 shown in Figure 23 and supporting a junction box 472 as described above with

respect to Figure 31. In view of these similarities, common reference numerals will be used and the discussion will focus upon the differences presented by sleeve 590. The sleeve has a cross-section essentially commensurate with the combined cross-section of support members 352, 254. The bottom of the sleeve includes a slot 592 defined by lips 594, 596. A bolt 598 is inserted through slot 386 of support member 352, slot 396 of support member 354, slot 592 of sleeve 590 and aperture 600 in junction box 472. By tightening nut 602 against washer 604, head 606 will bear against the lips of support member 352 and clamp the lips of each of the support members with the lips of the sleeve and the junction box to one another. Such clamping action will preclude movement of the support members relative to one another and the sleeve will serve in the manner of distributing the load imposed by a fixture attached to junction box 472. It is to be understood that insert 512/534 (Figures 22, 24) may include a slot instead of an aperture (520, 552) to provide the structure and benefits also described with respect to slot 592 in sleeve 590.

Referring jointly to Figures 36, 37, 38, 39 and 40, a variant apparatus for securing sleeve 590, as shown in Figures 33, 34 and 35 will be described. As shown in Figure 36, the mounting assembly may support either a junction box 472 for heavy loads or junction box 496 for lighter loads. The discussions of the junction boxes set forth above are applicable herein and will not be repeated. Sleeve 590 shown in Figures 36 and 38 is secured by a bolt 614 extending upwardly and threadedly engaged plate 610 having a threaded aperture 612. The width of the plate is configured commensurate with the side walls of support member 352 to permit the plate to rest upon lips 382, 384 of the support member. A bolt 614 extends upwardly through an aperture in either of junction boxes 472, 496, through the slots in sleeve 590 and support members 352, 354 into threaded engagement with threaded aperture 612 of plate 610. By tightening bolt 614, plate 610 will clamp the support members, the sleeve and the respective junction box to one another to prevent relative movement between the support members. Moreover, the sleeve will distribute any loads imposed by a fixture attached to the respective depending junction box.

A variant of plate 610 may be a disk 616 having a threaded aperture 618 as particularly shown in Figure 39 and 40. The apertured disk is located within support member 352, as shown for plate 610 in Figure 38. The function of disk 616 is identical with that of plate 610.

Referring jointly to Figures 41, 42, 43 and 44, a plate 620 is illustrated for clamping support members 352, 354 to one another and for supporting any of selected loads. Plate 620 rests within support member 354 upon lips 382, 384, which lips define slot 386. These lips rest upon lips 392, 394 defining slot 396 of support member 354. These slots are coincident with aperture 622 in junction box 472. Aperture 624 in plate 620 is threaded to permit threaded engagement by bolt 626 upon insertion of the bolt through aperture 622, slots 396, 386 and into threaded engagement with aperture 624. Upon tightening of the bolt, plate 620 will be drawn down to clamp the lips of support members 352, 354 between the plate and the junction box. Such clamping will secure the support members rigidly to one another and the loads imposed by the junction box will be distributed by the plate.

For heavy loads, or as a matter of convenience, plate 620 may include a pair of apertures 626, 628 coincident with the slots in the support members and apertures formed in the junction box. Thereby, a fixture to be attached to the junction box may be supported directly by plate 620 through bolts extending from the fixture into threaded engagement with apertures 626, 628. In the alternative, plate 620 may include a further pair of apertures 630, 632 of a different size to permit either of two pairs of conventionally used bolts (8-32, 10-32) to be used to secure a fixture directly to plate 620. As particularly shown in Figure 44, pairs of apertures 620, 628 and 630, 632 are coincident with the slots in the support members. Alternatively, the pairs of apertures may be located coincident with indentations 418, 452 (see Figures 14, 15, 16 and 17) in the junction box or laterally of the junction box.

Referring jointly to Figures 45, 46, 47 and 48, a variant of the configurations of the support members is illustrated. Support member 640, having one end terminated by

plate 356, is arcuate in cross-section and may have a constant or varying radius. Similarly, support member 642 is arcuate in cross-section and has a radius commensurate with support member 640 to permit support member 642 to nest therewithin. Plate 356 is disposed at one terminal end of support member 642. A clamp, such as brace 644, may be disposed interior of support member 642, between support member 640 and 642, as shown in Figure 46 or exterior thereof, as shown in Figures 47 and 48. Slots 646, 650 and 648 are disposed in the support members and in the brace. A bolt, which may be a carriage bolt 652, as shown in Figures 47 and 48, extends through slots 646, 648 and 650 into junction box 408 through an aperture 652. A nut 654 and washer 656 is threaded onto bolt 652. Upon tightening of the nut, the support members and brace are clamped to one another and the edges thereof rest upon junction box 48. Such clamping and contact with the junction box creates a rigid interconnection between the support members and the brace to preclude relative movement therebetween.

To further enhance the clamping of the support members and brace, a nut 658 may be threaded onto bolt 652, as shown in Figure 48, to clamp the support members and the brace between the head of the bolt and nut 658. This will provide a unitary rigid assembly. Junction box 408 may be attached to this rigid assembly by inserting the threaded shank of the bolt through aperture 652 in the junction box and threadedly engaging nut 654 to cause washer 656 to bear against the junction box and retain it against the lower edges of the support members and brace.

Figure 49 illustrates in cross-section a pair of support members similar to support members 640, 642 except that each support member is an inverted C-channel. An insert or brace 664 is also an inverted C-channel and nestingly mates with the nested support members. Bolt 652, along with nut 654 and washer 656 rigidly interconnect the support members and brace with junction box 408, as described in detail above.

Figures 50 and 51 illustrate a further variant of the support assembly shown in Figure 10. Support members 352, 354 may have a cross-section similar to that shown in Figure 13. Instead of a plate, as shown in Figure 13, an inverted C-channel 670 may be

used for the same purpose to achieve the same result. Opposed sides 672, 674 of the C-channel bear against lip 382 of support member 352 and lip 394 of support member 354. Upon tightening a nut 676 on the shank of a bolt 678 supported upon the C-channel and extending through the slot of the support members and into junction box 680 will clamp the support members to one another and to the junction box upon tightening nut 676. Such clamping will rigidly secure the support members to one another and the C-channel will distribute any loads imposed from a fixture attached thereto or from the junction box.

A fixture to be used with junction box 496 may be attached to the junction box by one or another mechanisms described above. Alternatively, bolts 506, as described above, may extend through ears 458 of junction 496 into threaded engagement with corresponding threaded apertures 682, 684 formed in C-channel 670.

Previously, the support assembly has been described as containing primarily two telescoping support members. As shown in Figure 50, three or more telescoping support members may be used, depending upon various factors unique to any given installation. Herein, an optional second support member 352' extends into support member 354 in telescoping relationship. Such three part support member structure is particularly adapted for use with an elongated support plate or elongated C-channel 670 illustrated and described above. If three support members are applied, the centrally oriented extremity of opposed support members 352, 352', must necessarily extend centrally sufficient to permit capture and engagement by C-channel to establish a rigid connection between support member 354 and each of support members 352, 352'.

Figure 52 is similar to Figure 50 except that previously described junction box 472 is attached instead of the previously described junction box 496. Accordingly, as also shown in Figure 54, threaded receivers 414 depend from C-channel 670. These threaded receivers may extend into and essentially through the junction box or may be coincident with indentations in the junction box, as described above and shown in Figures 10, 14, 15, 16 and 17. A detailed view of the depending relationship between threaded receiver 414 and C-channel 670 supporting the threaded receiver is shown in Figure 54.

As particularly illustrated in Figures 55 and 56, earlier described junction box 472 may be modified include indentations 418 in opposed sides for accommodating passage of threaded receivers 414 therethrough. Additionally, junction box 680 includes and a pair of external ears 686 having apertures 688 formed therein for passage of bolts 506, which ears are disposed in recesses 690 formed in opposed sides of the junction box. Ears 692 are disposed in recesses 690 and include threaded apertures 694 for threadedly receiving bolts 560. Even though previously described junction box 472 is illustrated in Figure 50, it is to be understood that junction box 680, shown in Figures 55 and 56 may be substituted therefore.

Figure 53 illustrates a side view of the support assembly shown in Figure 52. In particular, it shows plate 356 secured to one of support members 352, 354 and junction box 472 wherein bolts 506 may be utilized. These bolts penetrate the apertures in ears 458 and threadedly engage apertures 460 to attach a light weight fixture to junction box 472. Depending upon the type and nature of fixture to be attached, either or both of threaded receivers 414, with corresponding bolts, and bolts 506 may be used.

Referring to Figures 57, 58, 59 and 60, there are shown variations of the cross-sections for telescoping support members 352, 354. Although previously described junction box 472 is shown in Figure 57, it is to be understood that previously shown junction box 496, junction box 680 shown in Figures 55 and 56 or essentially any other junction box having a commensurate function may be used. In the embodiment shown in Figure 57, the cross-sectional configuration of support members 352, 354 is equivalent to that shown in previous figures. A bolt 700 extends through slots 386, 396 of support members 352, 354, respectively. A nut 702 threadedly engages bolt 700 along with washer 704. Upon tightening the nut, head 706 of the bolt is drawn against the lips of the support members to clamp the support members together and with the underlying section of junction box 472. Thereby, the support members are rigidly connected to one another.

As shown in Figure 58, support member 352 is essentially equivalent support member 352 shown in Figure 57. However, support member 354 includes a central

section somewhat differently configured from the equivalent central section of support member 352. Thus, Figure 58 is indictive of the fact that exact correspondence in cross-sectional configuration is not mandatory in order to have the support members telescope relative to one another or to provide the necessary rigidity to the support assembly.

Figure 60 illustrates support members 352, 354 having central sections essentially bowed in concentric relationship upwardly of the side walls.

Figure 61 illustrates support members 352, 354 which are essentially rectangular in cross-section and a nesting one within the other. Other configurations for the support members which permit them to be telescopically engaged with one another are also contemplated and are within the scope of this invention.

While the invention has been described with reference to several particular embodiments thereof, those skilled in the art will be able to make the various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention. It is intended that all combinations of elements and steps which perform substantially the same function in substantially the same way to achieve the same result are within the scope of the invention.

I CLAIM:

1. A mounting assembly for dependingly supporting a fixture, said mounting assembly comprising in combination:

(a) at least two support members, said support members including plate means for securing said support members intermediate a pair of supports;

(b) a clamp element for clamping said support members to one another and rigidly interconnect said support members; and

(c) means for dependingly supporting the fixture from said mounting assembly.

2. The mounting assembly as set forth in Claim 1 where said clamp element is a sleeve for enveloping said support members.

3. The mounting assembly as set forth in Claim 1 wherein said support members define a hollow space and wherein said clamp element is an insert disposed within said hollow space.

4. The mounting assembly as set forth in Claim 3 wherein said insert has a cross-section generally corresponding with the lateral cross-section of said hollow space.

5. The mounting assembly as set forth in Claim 3 wherein said insert is a plate.

6. The mounting assembly as set forth in Claim 1 wherein each of said support members comprises a hollow element having a longitudinal slot defined by in turned lips.

7. The mounting assembly as set forth in Claim 6 wherein said clamp element bears against the lips of one of said support members and including bolt means disposed within said slots for urging the corresponding lips of the other of said support members to bear against the lips of said one support member and clamp the lips of said support members therebetween.

8. The mounting assembly as set forth in Claim 7 wherein said clamp element is a sleeve for enveloping said support members.

9. The mounting assembly as set forth in Claim 8 wherein said sleeve includes a longitudinal slot corresponding with said slots of said support members and wherein said bolt means is disposed within said longitudinal slot.

10. The mounting assembly as set forth in Claim 9 wherein said bolt means is adapted to provide an element of the support for the fixture.

11. The mounting assembly as set forth in Claim 1 including bolt means secured to said clamp element for providing an element of the support for the fixture.

12. The mounting assembly as set forth in Claim 1 including bolt means for attaching a junction box to said clamp element to support the fixture.

13. A mounting assembly for dependingly supporting a fixture, said mounting assembly comprising in combination:

(a) first and second support members extendable between a pair of supports, said first and second support members including plate means for securing said support members to said pair of supports, said first and second support members having first and second cross-sections and defining coincident first and second slots;

(b) a clamp element for clamping said first and second support members to one another and rigidly interconnect said first and second support members

with one another, said clamp element including bolt means extending through said first and second slots; and

(c) support means for providing depending support for the fixture from said clamp element.

14. The mounting assembly as set forth in Claim 13 wherein each of said first and second support members include first and second pairs of lips defining the respective one of said first and second slots, said clamp element being adapted to clamp said first and second pairs of lips to one another.

15. The mounting assembly as set forth in Claim 14 wherein said clamp element includes an insert disposed internal of said first and second support members.

16. The mounting assembly as set forth in Claim 15 wherein said insert is a plate.

17. The mounting assembly as set forth in Claim 15 wherein said insert is substantially commensurate in cross-sectional configuration with and of lesser size than said first and second cross-sections.

18. The mounting assembly as set forth in Claim 17 wherein said insert is hollow.

19. The mounting assembly as set forth in Claim 15 wherein said insert includes an aperture coincident with said first and second slots for penetrable engagement by said bolt means.

20. The mounting assembly as set forth in Claim 19 wherein said aperture is threaded.

21. The mounting assembly as set forth in Claim 15 wherein said insert includes a slot coincident with said first and second slots for engaging said bolt means.

22. The mounting assembly as set forth in Claim 14 wherein said clamp element is a sleeve disposed about said first and second support members.

23. The mounting assembly as set forth in Claim 22 wherein said sleeve is substantially commensurate in cross-sectional configuration with and of greater size than said first and second cross-sections.

24. The mounting assembly as set forth in Claim 22 wherein said sleeve includes an aperture coincident with said first and second slots for engaging said bolt means.

25. The mounting assembly as set forth in Claim 24 wherein said aperture is threaded.

26. The mounting assembly as set forth in Claim 22 wherein said insert includes a slot coincident with said first and second slots for engaging said bolt means.

27. The mounting assembly as set forth in Claim 13 including a junction box, said junction box being adapted for penetrable engagement by said bolt means.

28. The mounting assembly as set forth in Claim 27 wherein said junction box includes further bolt means disposed therein for supporting the fixture.

29. The mounting assembly as set forth in Claim 28 wherein the part of said further bolt means disposed within said junction box is substantially smooth surfaced.

30. The mounting assembly as set forth in Claim 27 including further bolt means disposed external of said junction box and depending from said clamp element for

supporting the fixture, said junction box including a side wall having indentations for receiving said further bolt means.

31. The mounting assembly as set forth in Claim 13 wherein said clamp element comprises a brace extending across said first and second support members and including means for drawing a junction box against said brace to clamp said support members between said brace and the junction box.

32. The mounting assembly as set forth in Claim 31 wherein said brace includes means for supporting the fixture, said supporting means being disposed external of the junction box.

33. The mounting assembly as set forth in Claim 14 wherein said clamp element includes an inverted C-channel having side walls bearing against said first and second pairs of lips.

34. The mounting assembly as set forth in Claim 33 wherein said C-channel includes apertures coincident with said first and second slots and bolt means for securing a fixture to said apertures.

35. The mounting assembly as set forth in Claim 14 wherein said clamp element includes a plate external of said first and second support members for supporting the fixture and bolt means for engaging said plate and said first and second support members to draw said first and second pairs of lips to one another into a clamped engagement.

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36. The mounting assembly as set forth in Claim 35 including means for supporting a junction box from said plate.

37. A mounting assembly for dependingly supporting a fixture, said mounting assembly comprising in combination:

(a) at least two support members, said support members including plate means for securing said support members intermediate a pair of supports, each of said plate means including at least one aperture, each of said apertures including no more than a one revolution thread for capturing and retaining a screw to be screwed into a respective one of the pair of supports;

(b) a clamp element for clamping said support members to one another and rigidly interconnect said support members, said clamp element including bolt means for drawing a junction box against said support members to effect clamping of said support members to one another; and

(c) means for dependingly supporting the fixture from said mounting assembly.

38. The mounting assembly as set forth in Claim 37 including a double stick adhesive disposed on each of said plate means for initially attaching said mounting assembly to the pair of supports and a peelable sheet attached to said double stick adhesive for protection prior to use.

39. The mounting assembly as set forth in Claim 37 wherein said plate means is bendable relative to an attached one of said support members to reorient said plate means from one position to another position relative to the attached one of said support members to correspond with the location of a respective one of the pair of supports.

40. A mounting assembly for dependingly supporting a fixture, said mounting assembly comprising in combination:

(a) first and second support members extendable between a pair of supports, said first and second support members including plate means for securing said support members to the pair of supports, said first and second support members having first and second cross-sections terminating at longitudinally extending edges, first and second slots disposed in said first and second support members intermediate respective

ones of said edges; and

(b) a clamp element for clamping said first and second support members to one another and rigidly interconnect said first and second support members with one another, said clamp element including a brace extending along the outer surface one of said support members, aperture means disposed in said brace coincident with said first and second slots, bolt means extending through said aperture means and through said first and second slots for engaging a junction box to urge said brace to clamp said first and second support members to one another and into engagement with the junction box.

41. The mounting assembly as set forth in Claim 40 including nut means for engaging said bolt means to clamp said brace and said first and second support members to one another.

42. The mounting assembly as set forth in Claim 40 wherein said brace and said first and second support members define a curve in cross-section.

43. The mounting assembly as set forth in Claim 42 wherein the curve is an arc.

44. The mounting assembly as set forth in Claim 40 wherein said brace and said first and second support members define a C-channel in cross-section.

45. A method for dependingly supporting a fixture from a mounting assembly, said method comprising the steps of:

(a) attaching a pair of hollow slotted telescoping support members intermediate a pair of supports, each of the support members including a pair of lips defining the respective slot, each of the support members having equivalent cross-sections but of different size to accommodate telescoping movement therebetween;

(b) clamping the lips of the support members to one another with an

insert disposed within the pair of support members and a bolt extending from the insert through the slots for engagement with a junction box to clamp the pairs of lips between the insert and the junction box; and

(c) providing bolt means for attaching the fixture.

46. The method as set forth in Claim 45 wherein said step of providing includes the step of dependingly supporting the bolt means from the insert.

47. The method as set forth in Claim 45 wherein the insert has a cross-section equivalent in configuration of the support members but smaller in size and of a length not less than the width of the junction box, said step of clamping including the step of preventing bending of the support members at the location of the bolt means by interfering contact between the insert and the support members.

48. A method for dependingly supporting a fixture from a mounting assembly, said method comprising the steps of:

(a) attaching a pair of hollow slotted telescoping support members intermediate a pair of supports, each of the support members including a pair of lips defining the respective slot, each of the support members having equivalent cross-sections but of different size to accommodate telescoping movement therebetween;

(b) clamping the lips of the support members to one another with a sleeve disposed about the pair of support members and a bolt extending from within the pair of support members through the sleeve for engagement with a nut to clamp the pair of lips of the support members between the head of the bolt and the sleeve; and

(c) suspending the fixture indirectly from the sleeve.

49. The method as set forth in Claim 48 including the step of attaching a junction box to the sleeve with the bolt.

50. The method as set forth in Claim 49 including the step of suspending the fixture from within the junction box.

51. The method as set forth in Claim 49 including the step of suspending the fixture from the sleeve external to the junction box.

52. A method for dependingly supporting a fixture from a mounting assembly, said method comprising the steps of:

(a) attaching a pair of slotted telescoping support members intermediate a pair of supports, each of the support members including a pair of lips defining the respective slot, each of the support members having equivalent cross-sections but of different size to accommodate telescoping movement therebetween;

(b) mounting a brace having opposed panels across the support members;

(c) securing opposed ends of the brace to a junction box;

(d) drawing the opposed panels of the brace toward the junction box to clamp the pair of support members to one another and to the junction box; and

(e) suspending the fixture from the mounting assembly.

53. The method set forth in Claim 52 including the step of suspending the fixture from within the junction box.

54. The method set forth in Claim 52 including the step of suspending the fixture from the brace.

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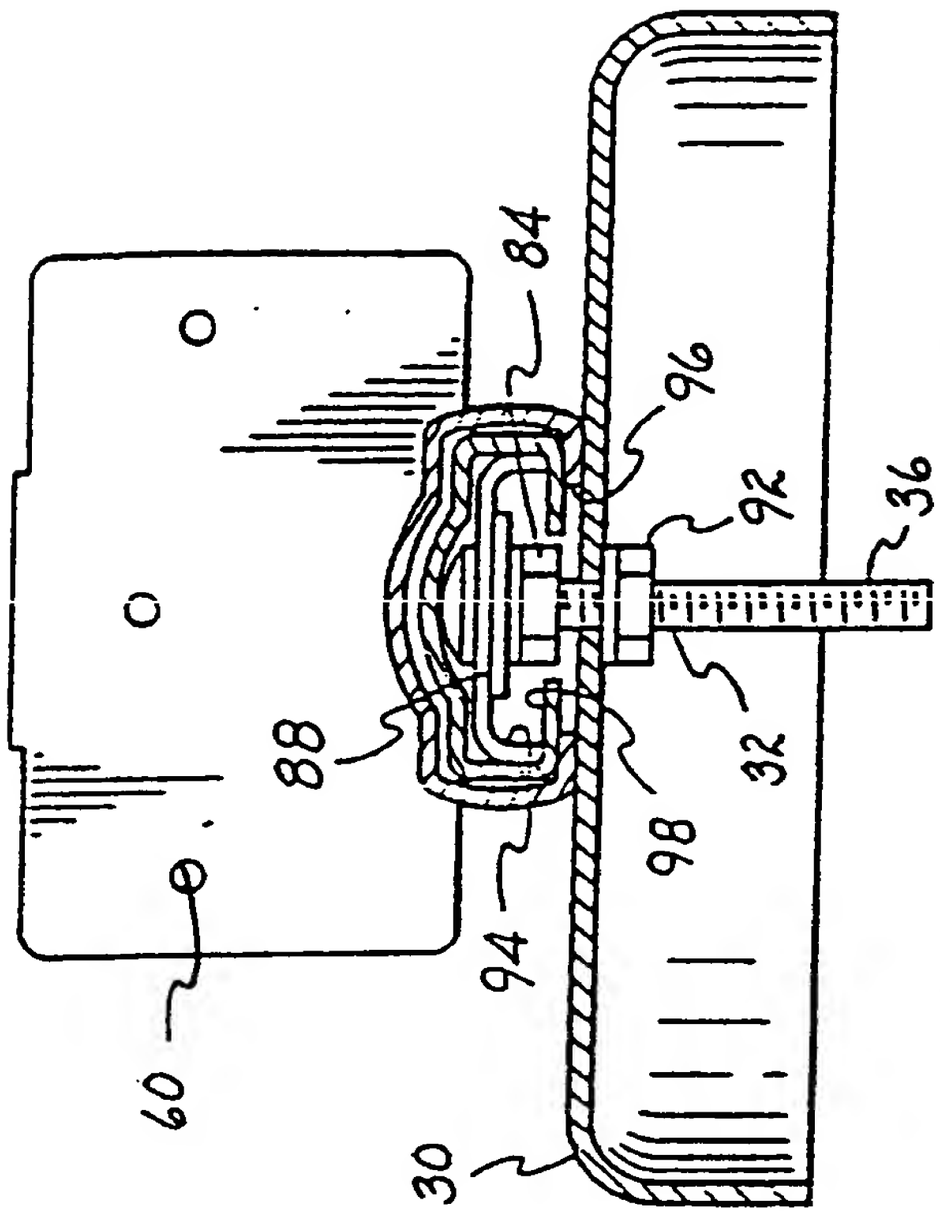
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60
30

FIG. 3

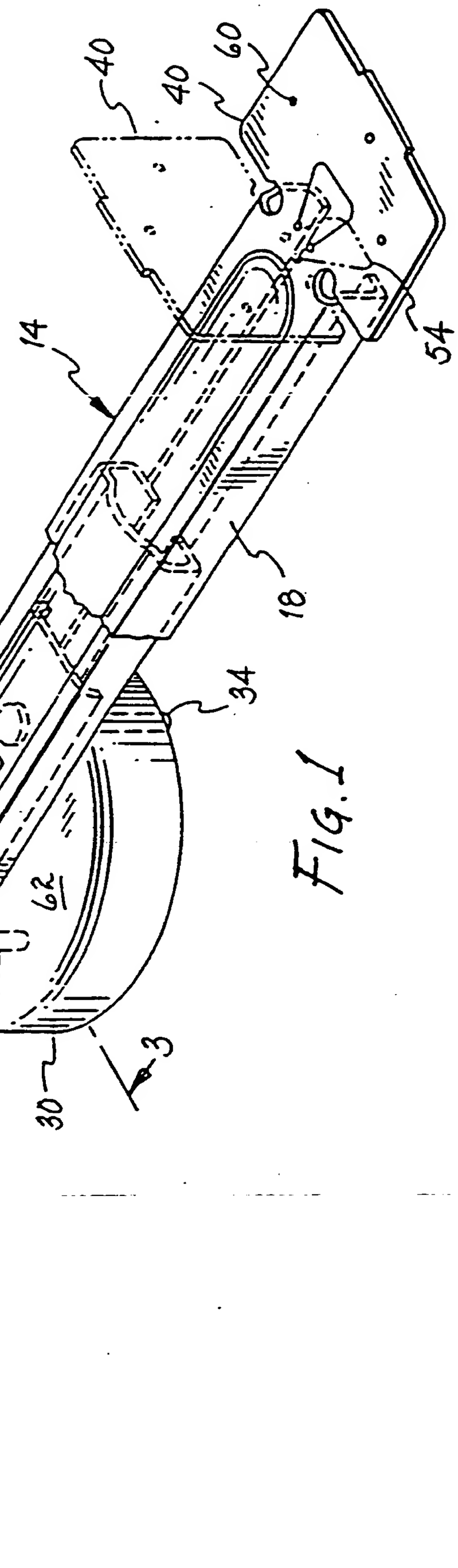
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FIG. 1

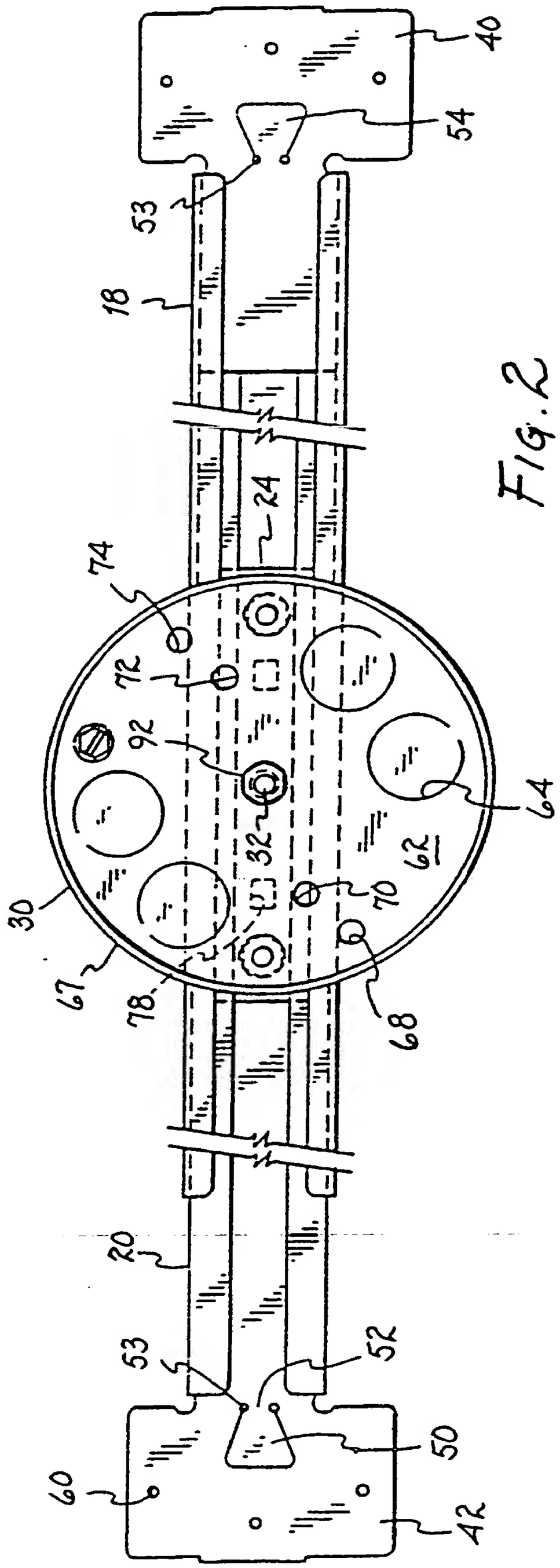
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Fig. 2

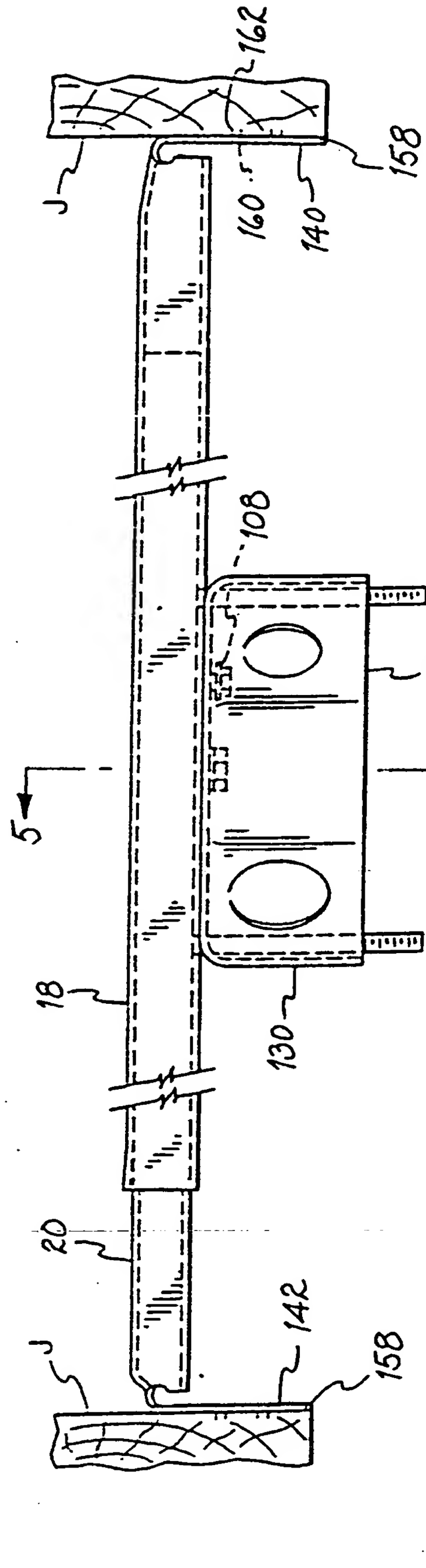
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Fig. 4

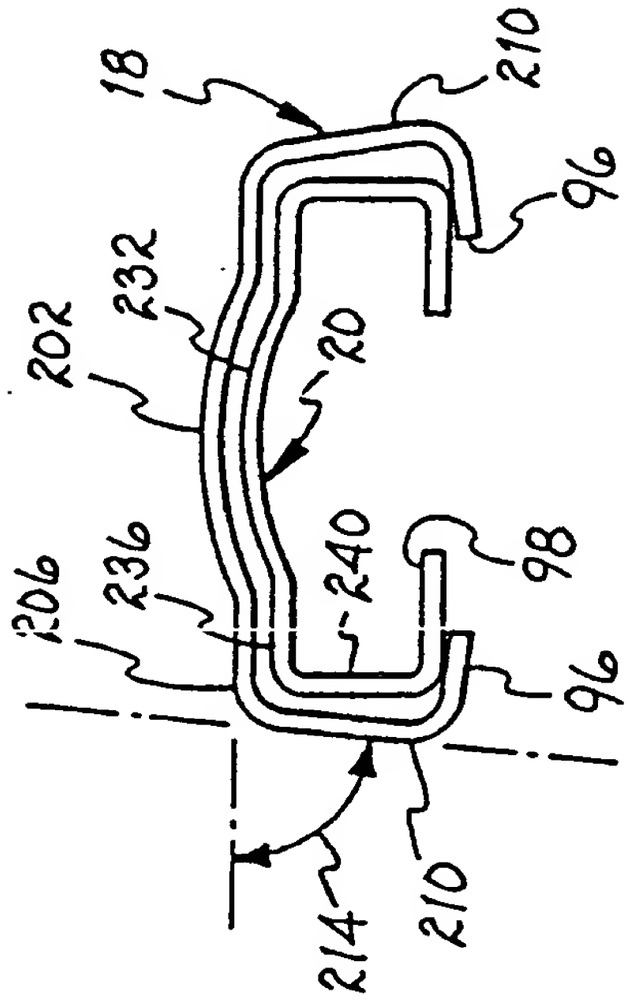

FIG. 7

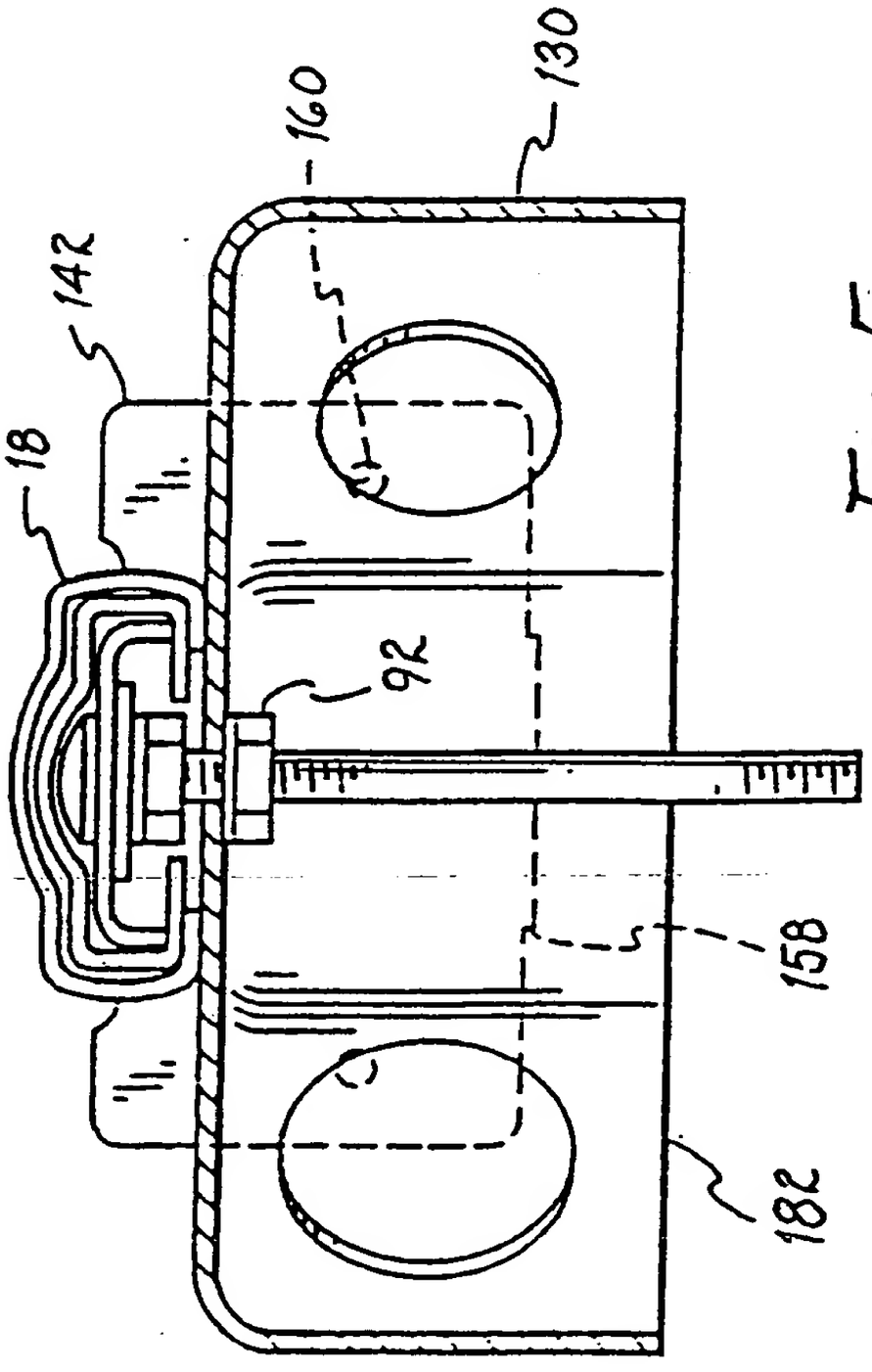

FIG. 5

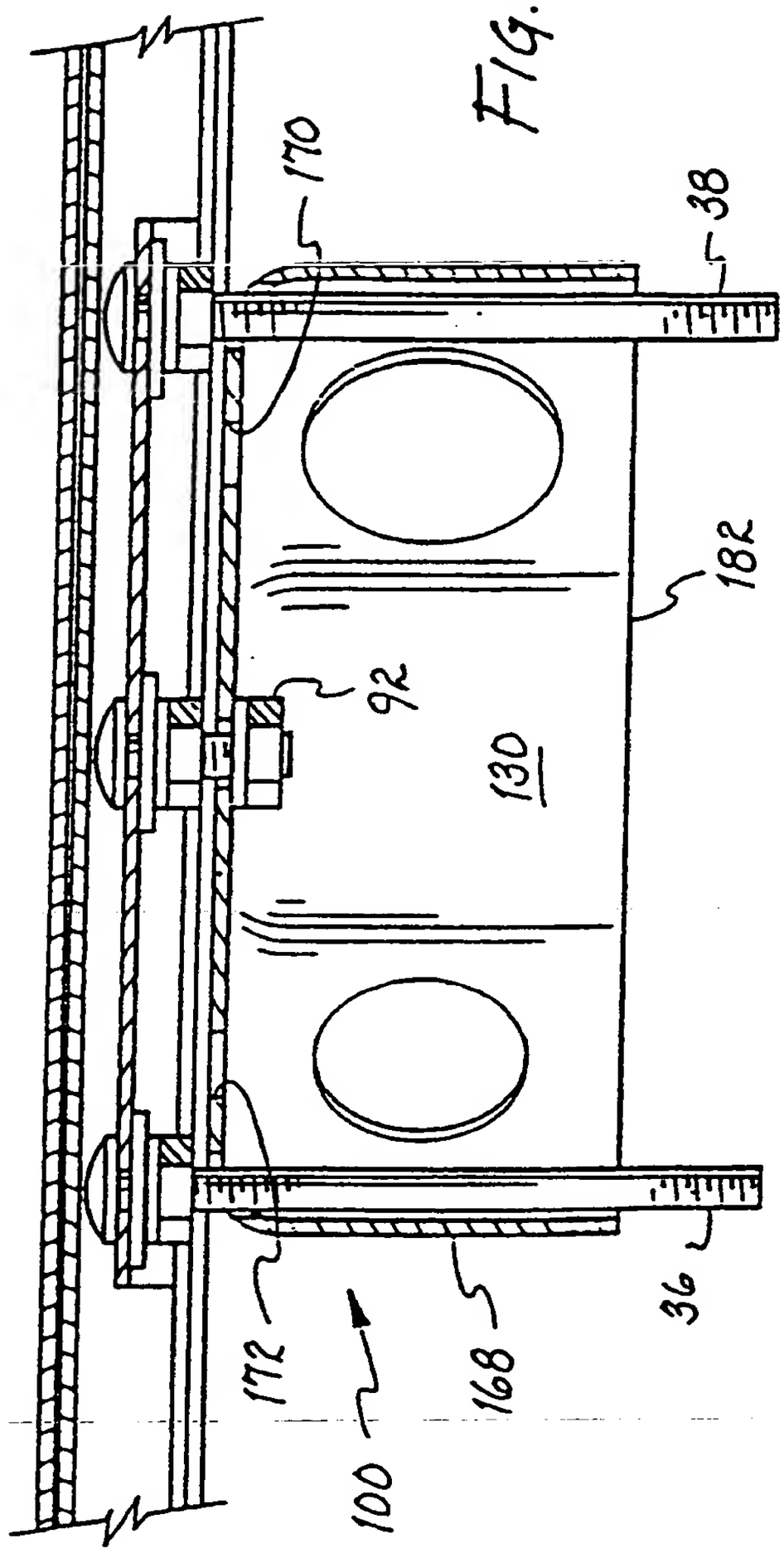

FIG. 6

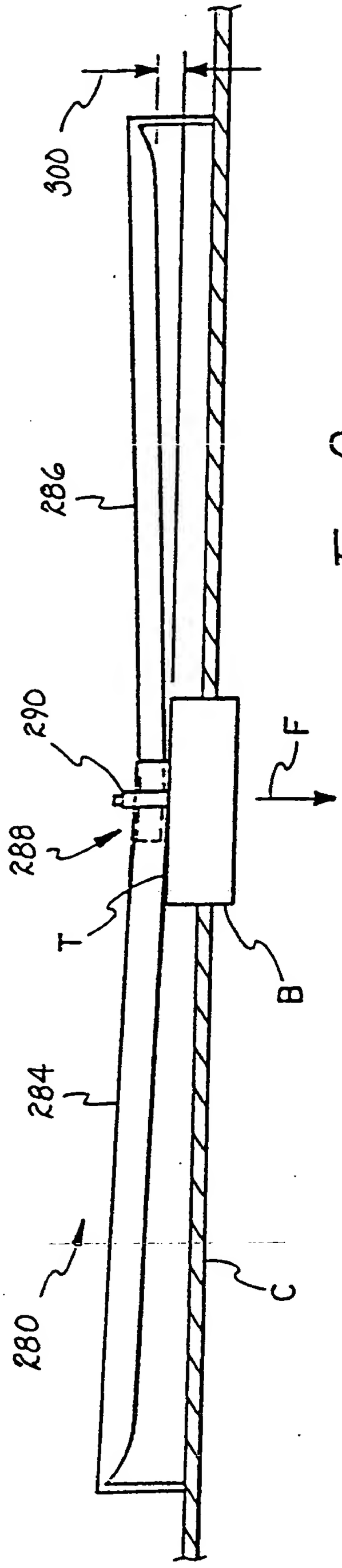

FIG. 9 (PRIOR ART)

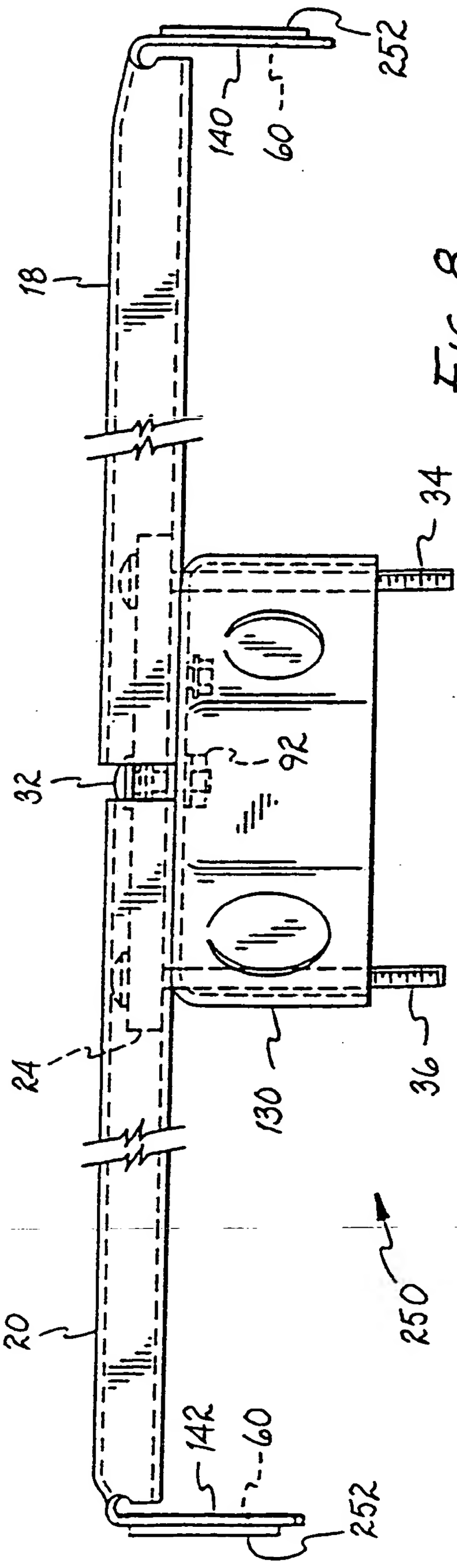

FIG. 8

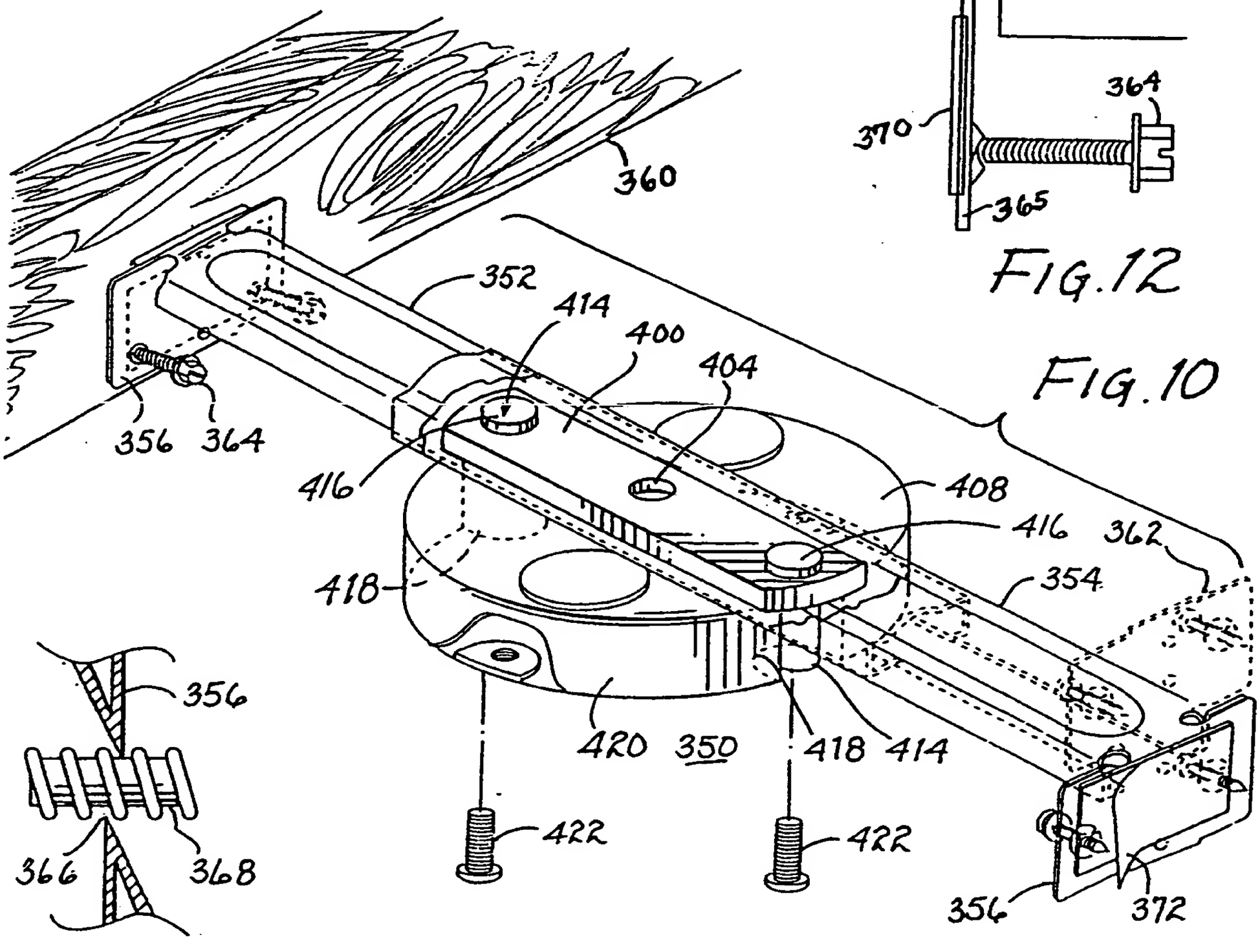

FIG. 10

FIG. 12

FIG. 11

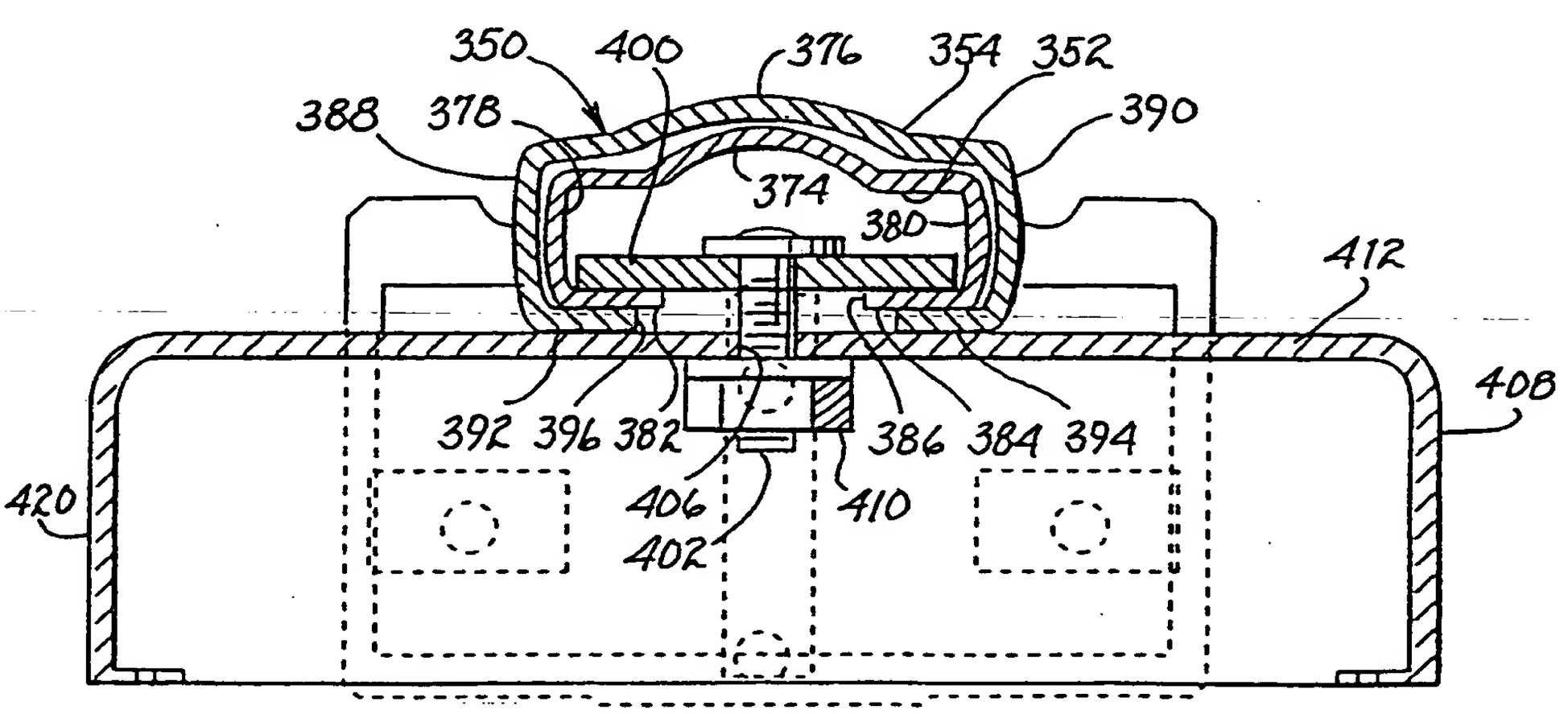

FIG. 13

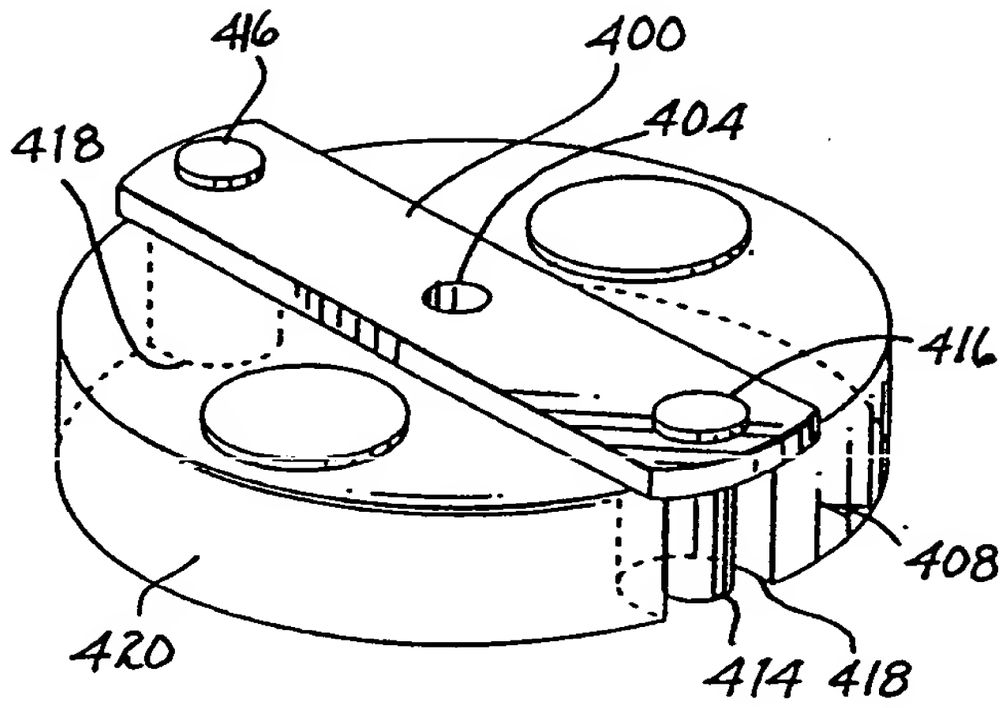

FIG. 14

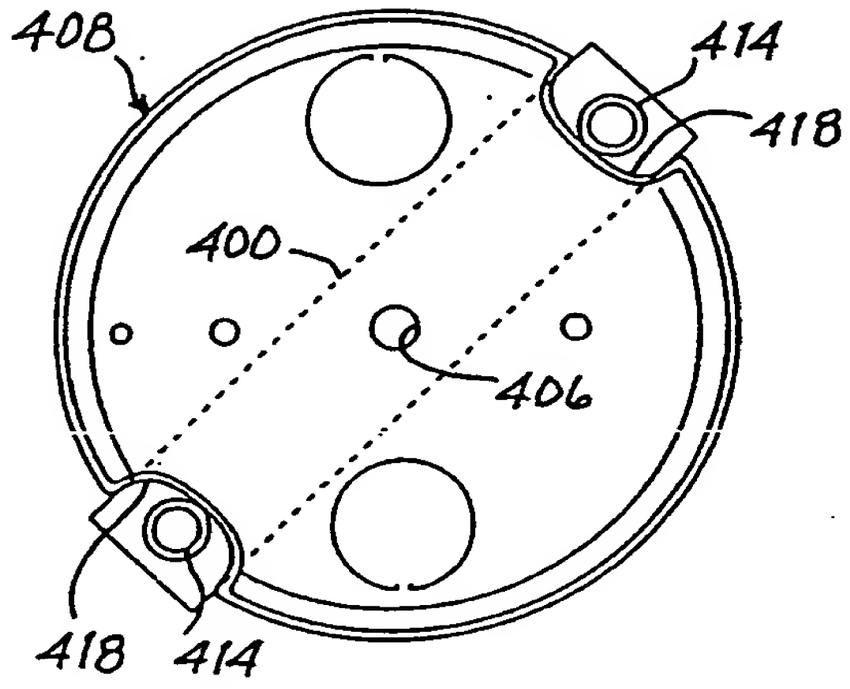

FIG. 15

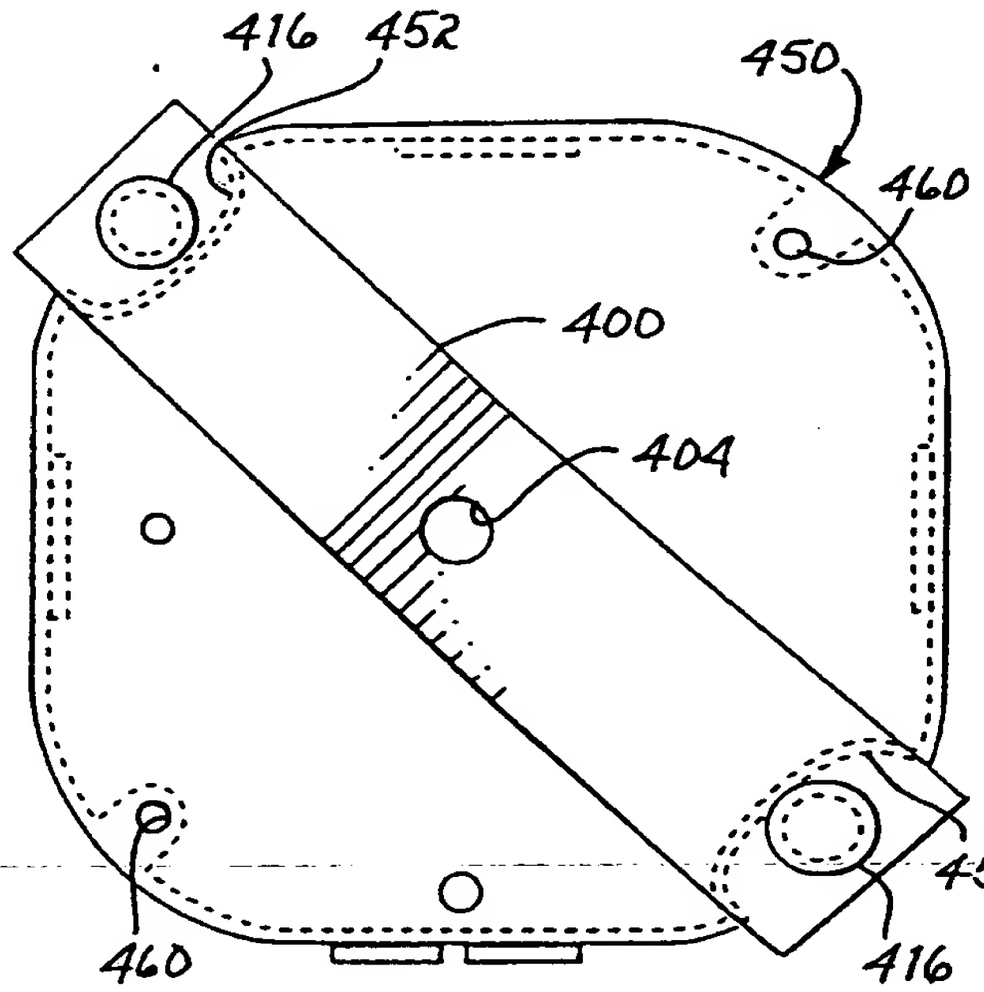

FIG. 16

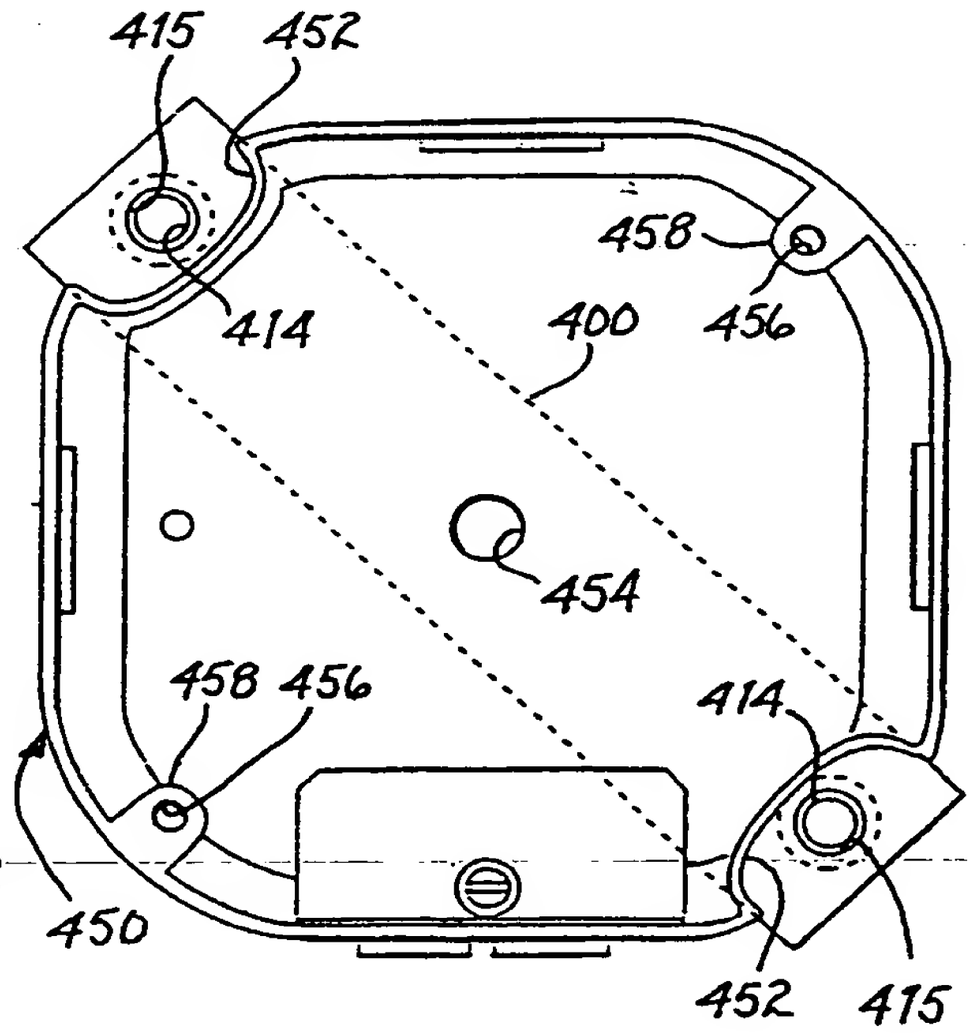

FIG. 17

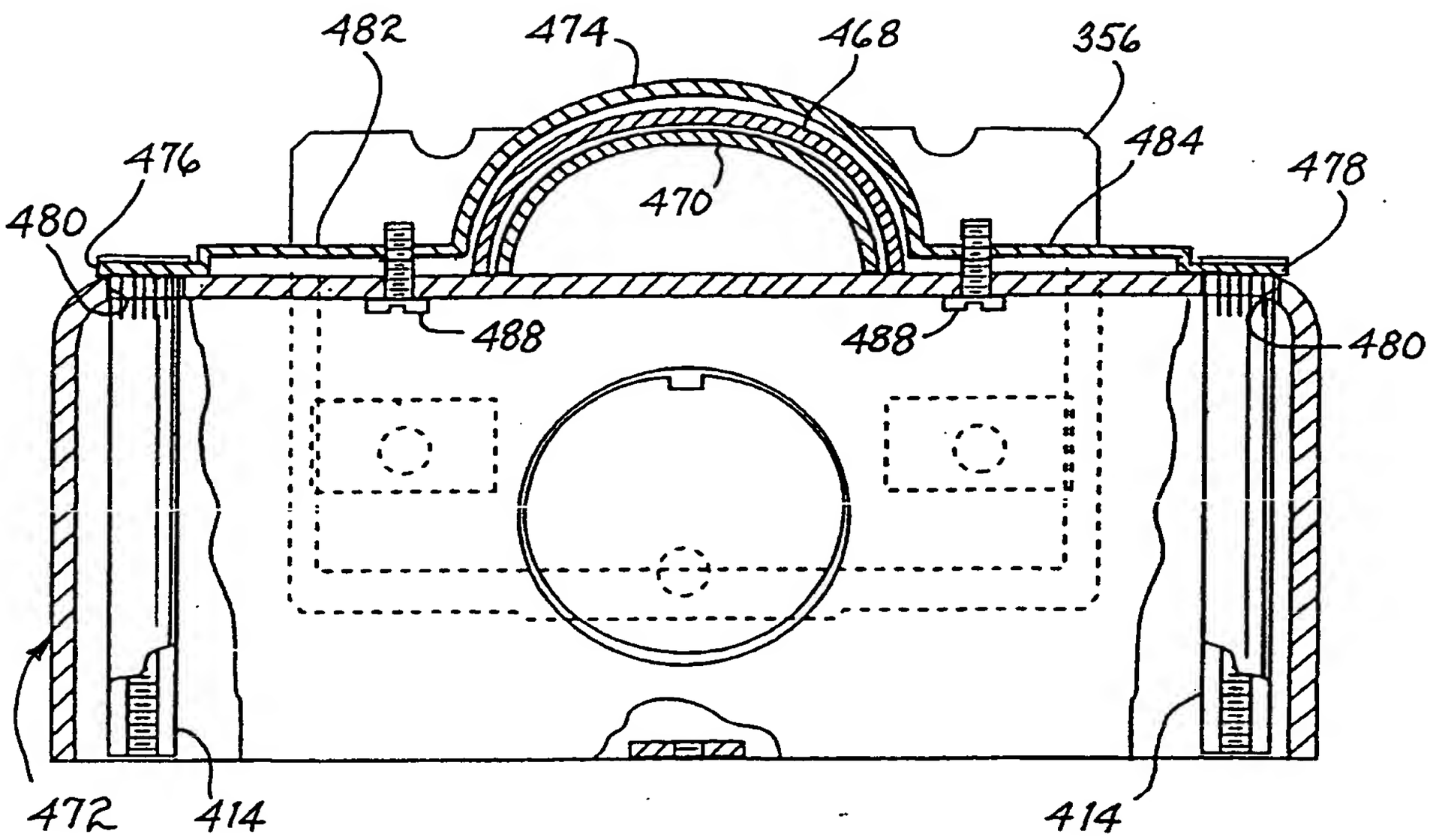
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FIG. 18

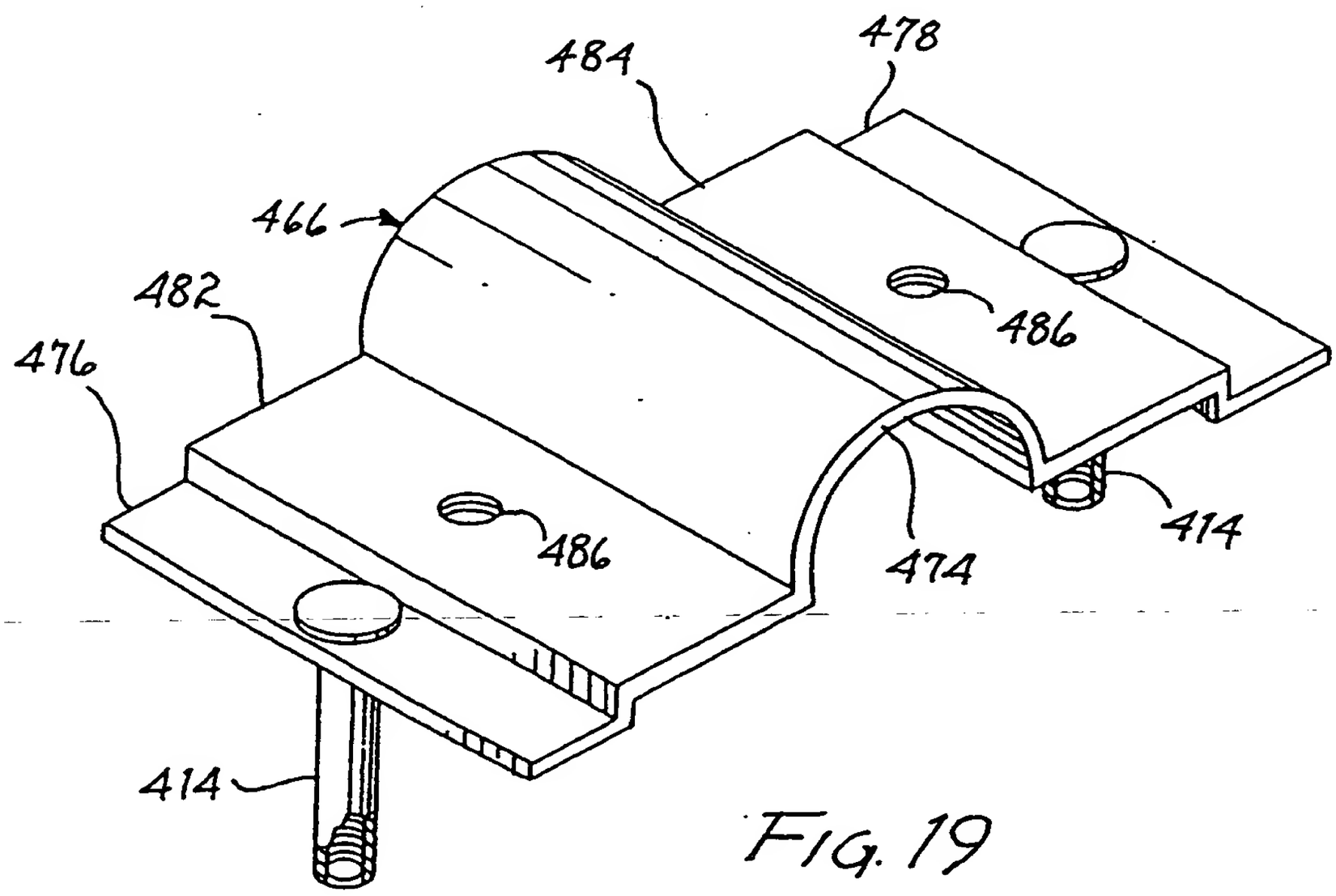
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FIG. 19

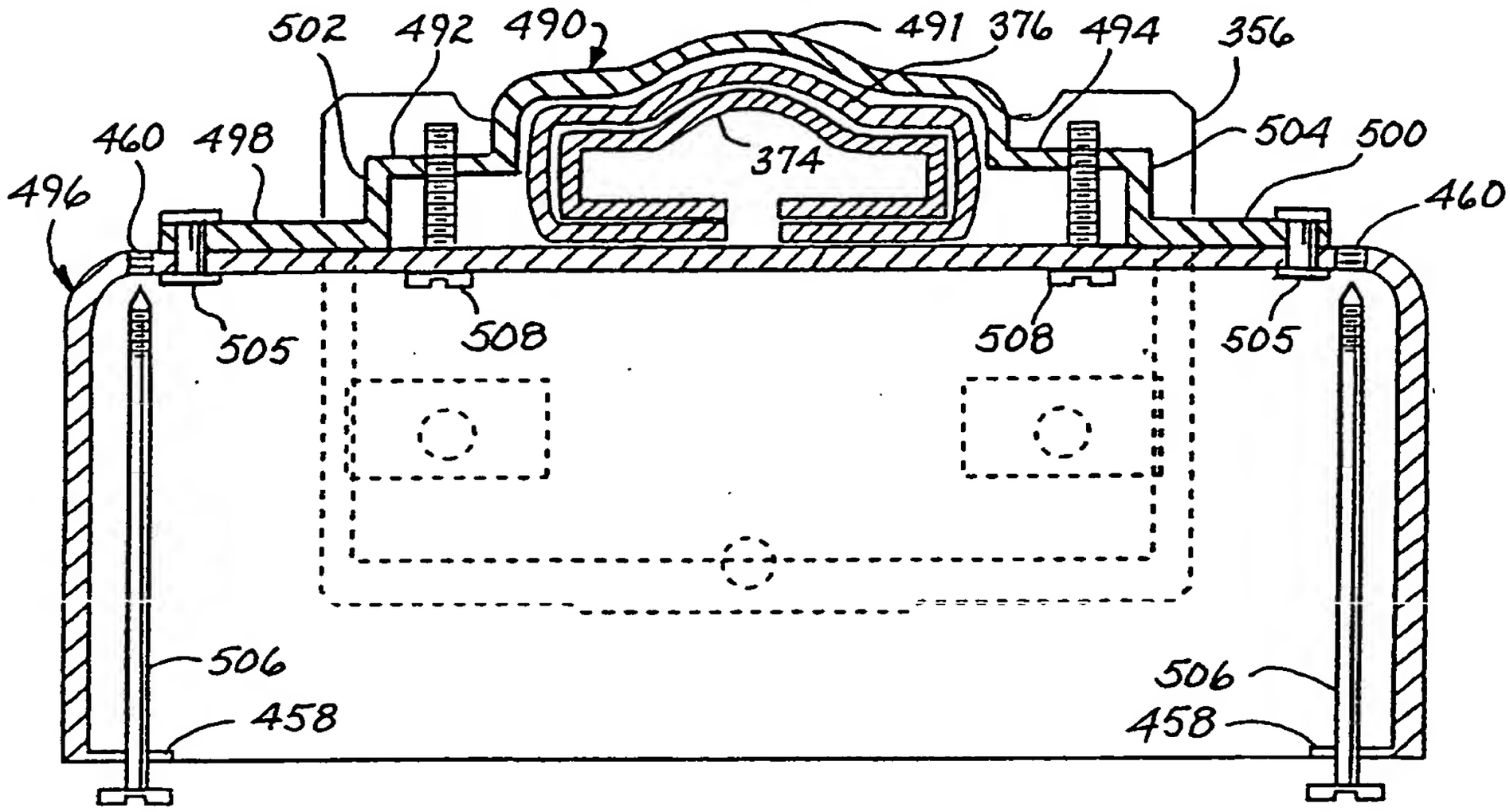

FIG. 20

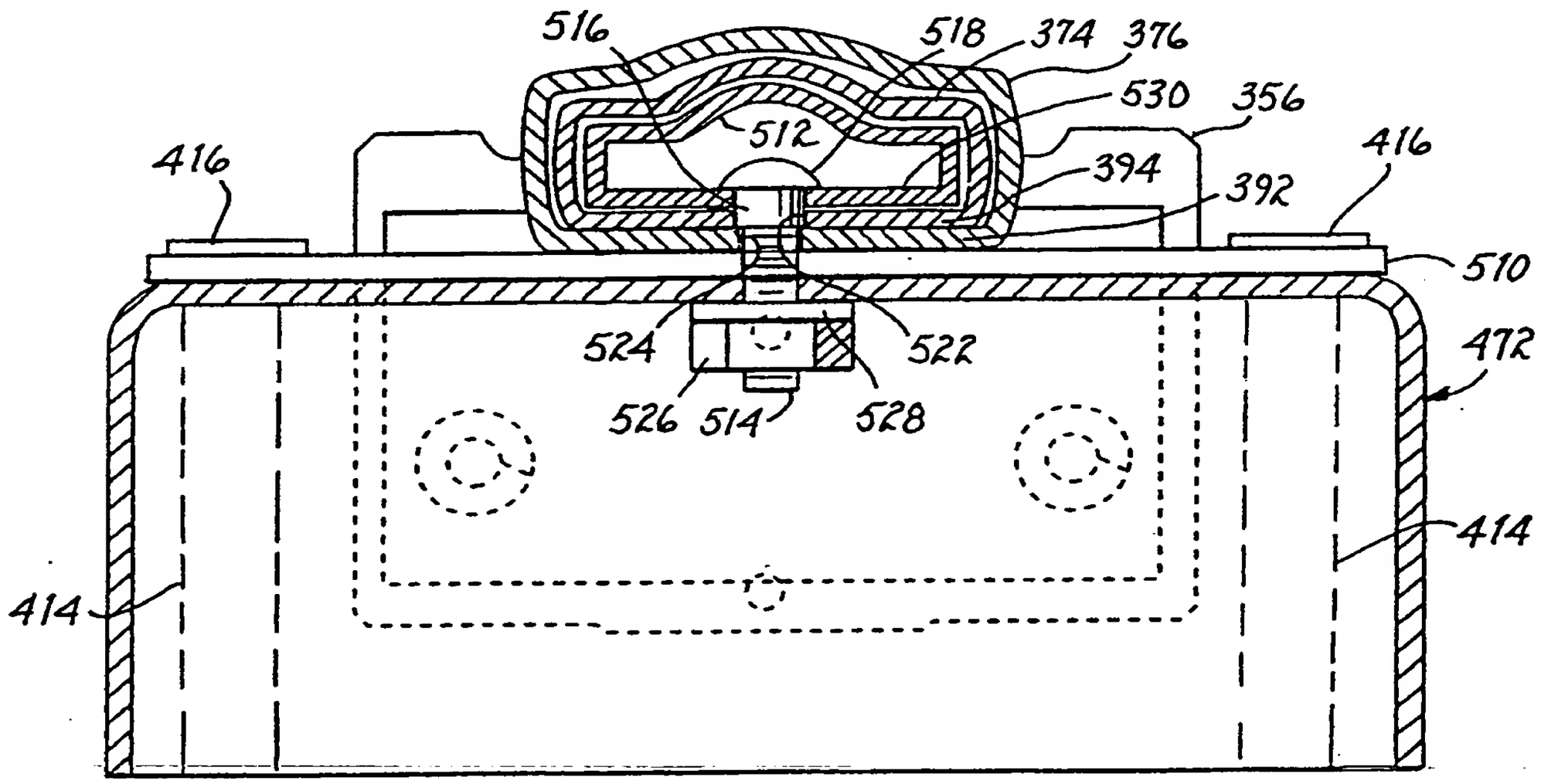

FIG. 21

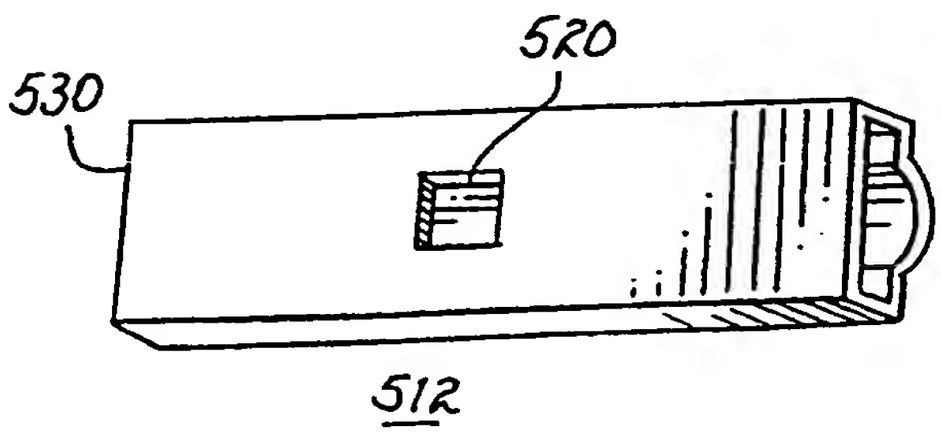

FIG. 22

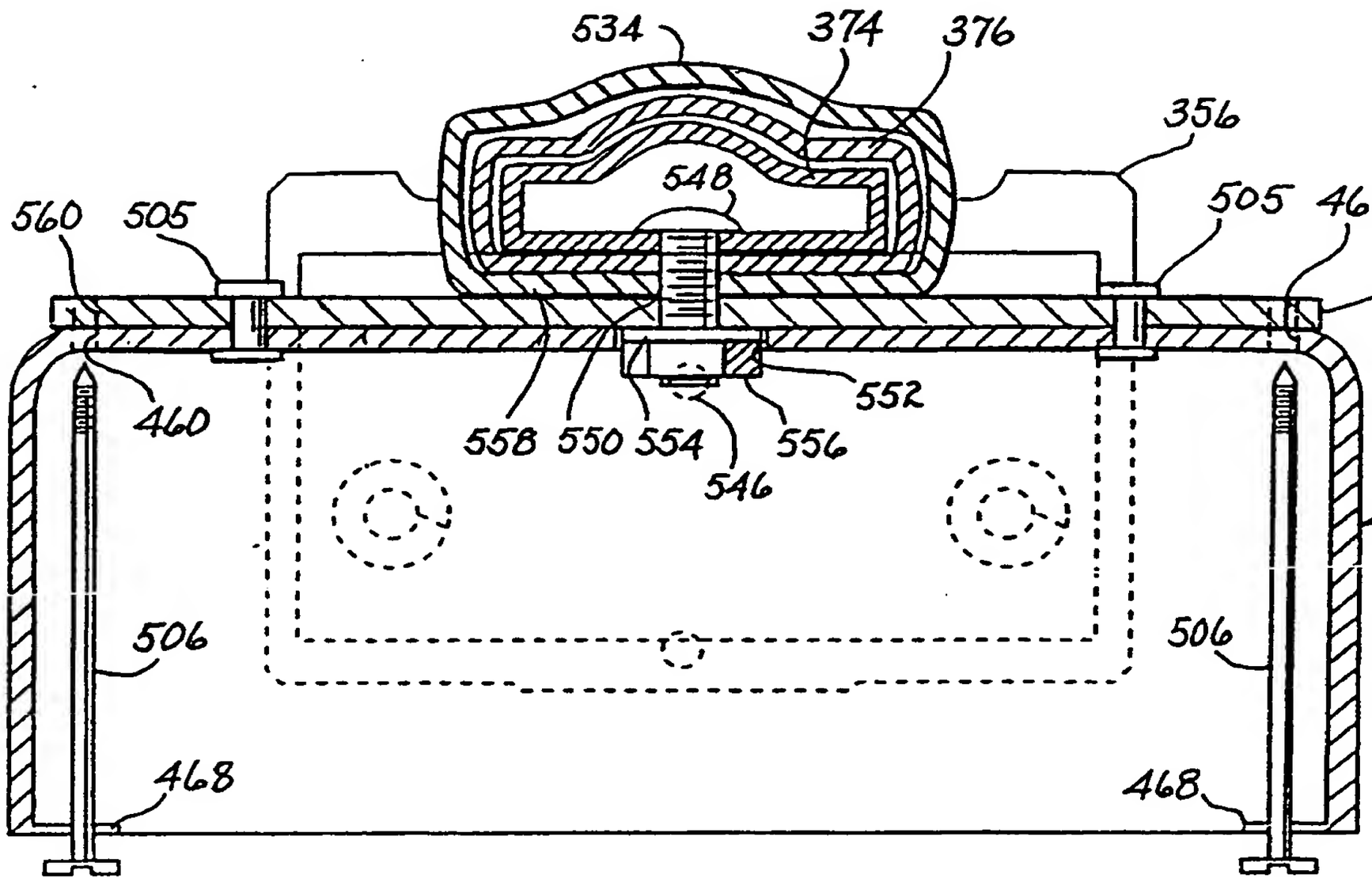

FIG. 23

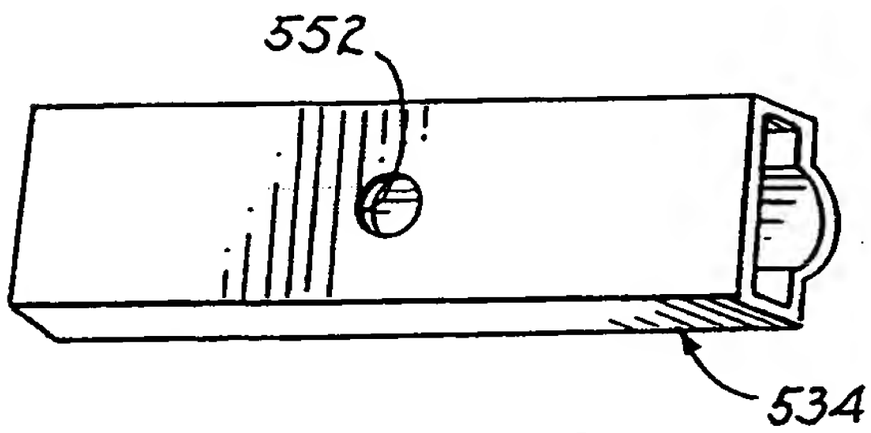

FIG. 24

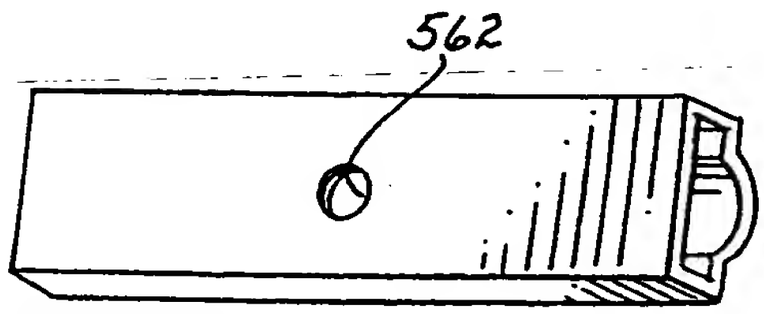

FIG. 25

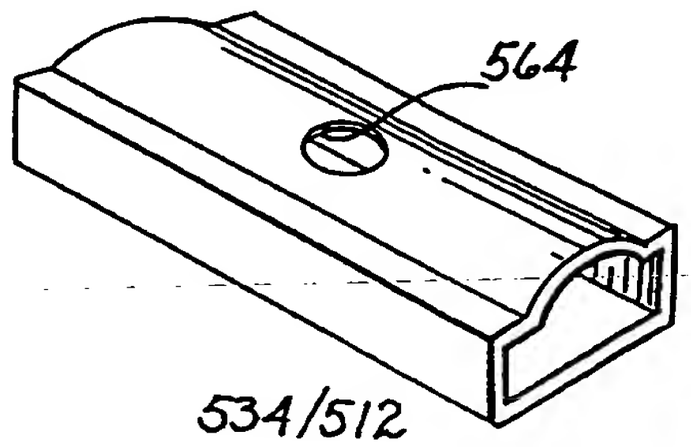

FIG. 26